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DOE/RL 88-08
Revision 6
Copy No. 5

Simulated High Level Waste Slurry Treatment and Storage (SHLWS) T/S Unit Closure Plan

United States
Department of Energy
Richland, Washington

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CLOSURE PLAN

SIMULATED HIGH LEVEL WASTE SLURRY TREATMENT AND STORAGE (SHLWS T/S) UNIT

June 15, 1994

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1.0 PART A PERMIT APPLICATION

1.1 INTRODUCTION

The Simulated High-Level Waste Slurry (SHLWS) Treatment and Storage (T/S) unit is an open area, within a fenced-in yard, that was used to store containerized simulated high-level waste slurry. The unit was also used to treat this waste in a grout/stabilization process. The untreated slurry was originally considered to be a mixed waste because, in addition to being designated a dangerous waste, it contained elevated levels of natural radioactivity. However, analysis of the waste at the time of treatment indicated that the radioactivity of the waste was low enough for it to be managed as a nonradioactive waste, defined by the U.S. Department of Transportation under 49 CFR 173 as less than 2 nCi/g. The slurry was designated as a dangerous waste because it contained toxic constituents, was corrosive, was ignitable, and contained dissolved metals above the limits given in the Extraction Procedure (EP) Toxicity test [Method 1310A, which has since been replaced by Method 1311, Toxicity Characteristic Leaching Procedure (TCLP)]. The treated slurry is not designated as dangerous waste, and the levels of radioactivity in the treated waste were low enough for the waste to be managed at the Hanford Site as nonradioactive solid waste.

The SHLWS was procured for a research demonstration program that was subsequently cancelled. The treatment program was initiated on September 13, 1988, and ended on October 28, 1988. Although some of the slurry was used in other programs, the remaining material was declared surplus and thereby became a solid waste requiring management in compliance with the Washington Dangerous Waste Regulations (WAC 173-303). A Part A, Form 3 Permit Application was submitted for the SHLWS T/S unit for treatment of the SHLWS, as well as for storage of the containerized slurry prior to treatment. The permit application included only the inventory of wastes in storage at the time the permit was submitted; no other wastes were or will be stored or treated under

this permit. The Part A Permit Application for this unit was submitted May 23, 1988, by the U.S. Department of Energy-Richland Operations Office (DOE-RL) to the Washington State Department of Ecology (Ecology) and to Region X of the U.S. Environmental Protection Agency (EPA). This Closure Plan was initially submitted to Ecology and EPA in September 1989.

1.2 PART A PERMIT APPLICATION

The following Dangerous Waste Permit Application, Form 3, Rev 1 (submitted June 21, 1990) contains a description of waste treatment and storage conditions and designation codes for the wastes at the SHLWS T/S unit.

The SHLWS unit is located in the 3000 Area of the Hanford Site. DOE recently requested that a separate dangerous waste identification (ID) number be assigned to the 3000 Area. The Notification of Dangerous Waste Activities, Form 2, for the 3000 Area was submitted to Ecology on May 12, 1994. When the ID number is granted, documents relating to the closure of this unit, including the Dangerous Waste Permit Application, Form 3, and the closure plane, will be modified appropriately.

1.3 REFERENCES

WAC 173-303. "Dangerous Waste Regulations."

PART A
DANGEROUS WASTE PERMIT APPLICATION
(FORM 3)
Rev. 1

Please print or type in the unshaded areas only
(shaded areas are spaced for elite type, i.e., 12 characters/inch)

FORM 3

DANGEROUS WASTE PERMIT APPLICATION

I. EPA/STATE I.D. NUMBER: W A 7 8 9 0 0 0 8 9 6 7

FOR OFFICIAL USE ONLY

APPLICATION	DATE RECEIVED	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below (mark one box only) to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA/STATE I.D. Number, or if this is a revised application, enter your facility's EPA/STATE I.D. Number in Section I above.

A. FIRST APPLICATION (place an "X" below and provide the appropriate date)

☐ 1. EXISTING FACILITY (See instructions for definition of "existing" facility. Complete item below.)

FOR EXISTING FACILITIES, PROVIDE THE DATE (mo., day, & yr.) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED (use the boxes to the left)

☐ 2. NEW FACILITY (Complete item below.)

FOR NEW FACILITIES, PROVIDE THE DATE (mo., day, & yr.) OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION (place an "X" below and complete Section I above)

☒ 1. FACILITY HAS AN INTERIM STATUS PERMIT

☐ 2. FACILITY HAS A FINAL PERMIT

III. PROCESSES — CODES AND DESIGN CAPACITIES

A. PROCESS CODE — Enter the code from the list of process codes below that best describes each process to be used at the facility. Two lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process (including its design capacity) in the space provided on the (Section III-C).

B. PROCESS DESIGN CAPACITY — For each code entered in column A enter the capacity of the process.

1. AMOUNT — Enter the amount.

2. UNIT OF MEASURE — For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER (barrel, drum, etc.)	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D80	GALLONS OR LITERS
LANDFILL	D81	ACRE-FEET (the volume that would cover one acre to a depth of one foot) OR HECTARE-METER (the volume that would cover one hectare to a depth of one meter)
LAND APPLICATION	D82	ACRES OR HECTARES
OCEAN DISPOSAL	D83	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D84	GALLONS OR LITERS

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER (Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Section III-C.)	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	K
HECTARES	Q

EXAMPLE FOR COMPLETING SECTION III (shown in line numbers X-1 and X-2 below): A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. PROCESS DESIGN CAPACITY 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. PROCESS DESIGN CAPACITY 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S02	600	G		5				
X-2	T03	20	E		6				
	S01	20,000	G		7				
3	T04	550	U		8				
					9				
					10				

III. PROCESSES (continued)

7. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESS (code "T04"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

T04, S01--This permit covers a one-time proposal to immobilize approximately 200 55-gallon drums of a simulated high level waste slurry (formerly known as "PW-0" and "PW7/7A" material). The program that originally procured this specialty chemical was eliminated before the material was used for R&D purposes. Although the material had been used intermittently, all remaining material with no future use was treated.

The treatment process consisted of neutralization and mixing with a grout within lined 55-gallon, DOT 17H containers. The treatment eliminated the characteristics of ignitability, corrosivity and EP Toxicity. Photographs of the treatment equipment and area are attached.

The grouted slurry has been stored in drums at the site of treatment (1100 Area, see attached drawing) until tests (EP Toxicity, Acute Fish and Rat Toxicity) were completed. These tests verified that the treated waste exhibits no dangerous waste characteristics.

IV. DESCRIPTION OF DANGEROUS WASTES

A. DANGEROUS WASTE NUMBER — Enter the four digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed dangerous waste: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed dangerous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER — Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

1. Select one of the Dangerous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other Dangerous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other Dangerous Waste Number that can be used to describe the dangerous waste.

EXAMPLE FOR COMPLETING SECTION IV (shown on line numbers X-1, X-2, X-3, and X-4 below) — A facility will treat and dispose of an estimated 900 pounds per year of chrome sheavings from leather tanning and finishing operations. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. DANGEROUS WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
X-1	K 0 5 4	900	P	T 0 3 D 8 0	
X-2	D 0 0 2	200	P	T 0 3 D 8 0	
X-3	D 0 0 1	100	P	T 0 3 D 8 0	
X-4	D 0 0 2			T 0 3 D 8 0	included with above

EQ 7711- ECY 030-31 Form 3

CONTINUE ON PAGE 3

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

I.D. NUMBER (enter from page 1)

W A 7 8 9 0 0 0 8 9 6 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D001	150,000	P	S01 T04	Storage/Treatment
2	D002	Includes the above			
3	D005				
4	D006				
5	D007				
6	D011				
7	WT01				
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

ECY 030-31 Form 3 PAGE 3 OF 5 CONTINUE ON REVERSE

(enter "A", "B", "C" etc. during the "3" to denote photocopied pages)

Continued from the front

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

E USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM SECTION D(1) ON PAGE 3.

Material to be treated was designated as ignitable (D001), corrosive (D002) due to pH ≤2.0 and EP Toxic due to barium (D005), cadmium (D006), chromium (D007), and silver (D011), and was also slightly radioactive (≤ 2000pCi/g) due to naturally-occurring elements present. (This level of natural occurring radiation is not sufficient to designate the material as radioactive mixed waste [RMW].) The waste slurries were designated as extremely hazardous waste (EHW) toxic mixtures (WT01). This designation was due to the concentration and toxicity of nitric acid and metallic nitrate salts (i.e., silver nitrate, ferric nitrate) present in the wastes.

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (see instructions for more detail).

VI. PHOTOGRAPHS * This information appears on the attached drawing and photographs.

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

VII. FACILITY GEOGRAPHIC LOCATION This information is provided on attached drawings and photos

LATITUDE (degrees, minutes & seconds)	LONGITUDE (degrees, minutes, & seconds)

VIII. FACILITY OWNER

[X] A. If the facility owner is also the facility operator as listed in Section VII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

[ ] B. If the facility owner is not the facility operator as listed in Section VII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO (area code & no.)

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST	6. ZIP CODE

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME (print or type)	SIGNATURE	DATE SIGNED
Michael J. Lawrence Manager, Richland Operations United States Department of Energy	Michael J. Lawrence	6-21-90

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

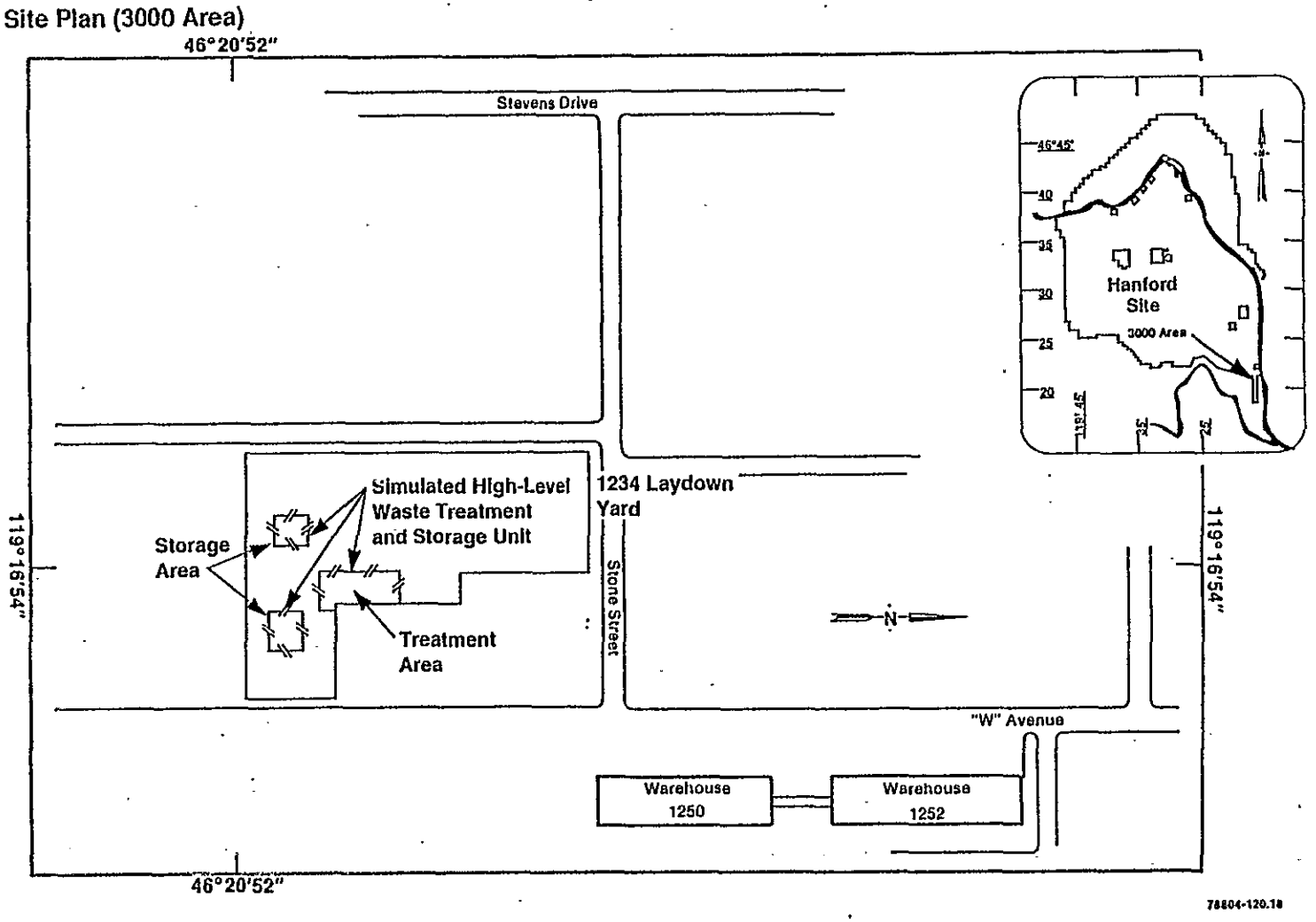
NAME (print or type)	SIGNATURE	DATE SIGNED
SEE ATTACHMENT		

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

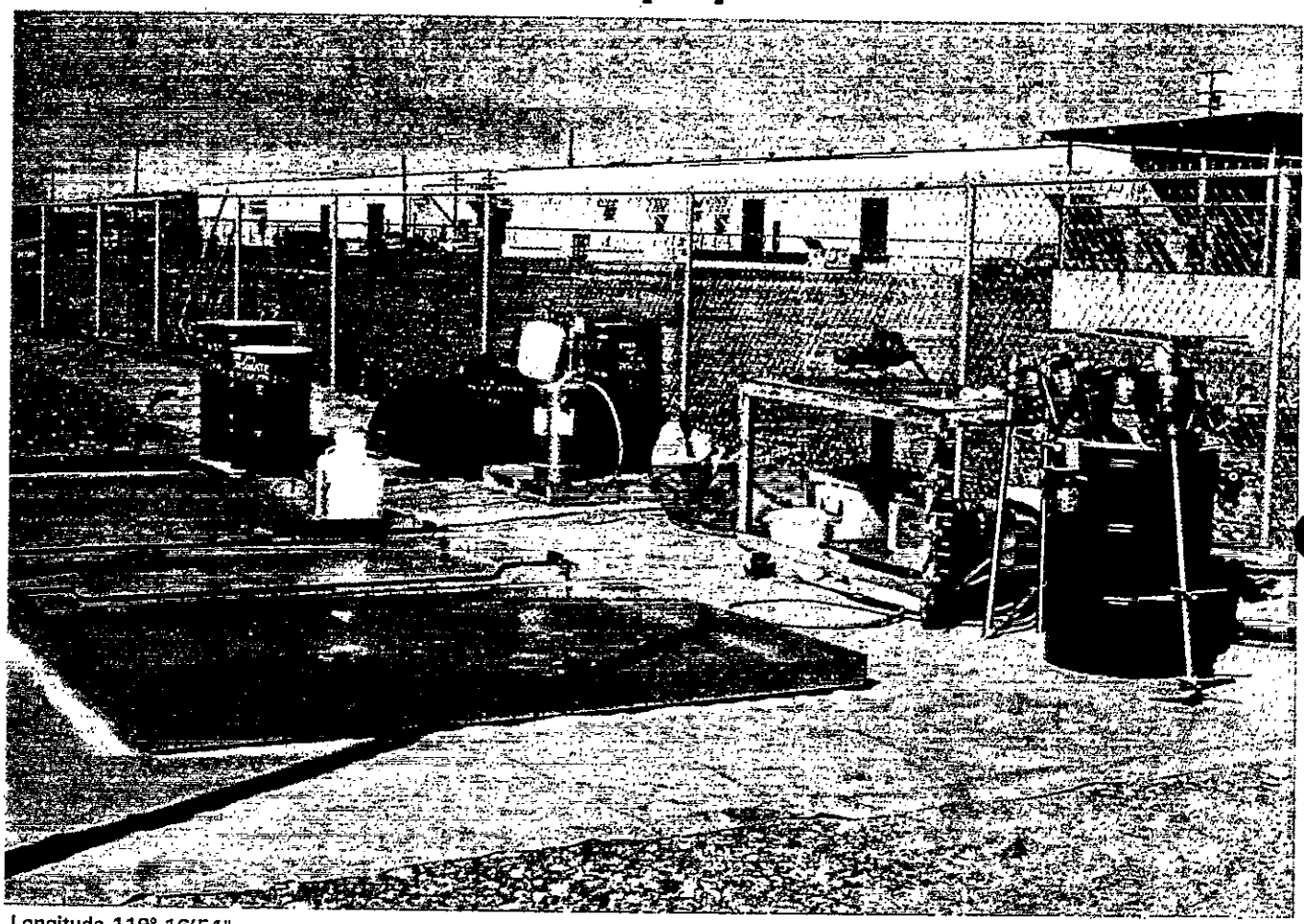
Michael J. Lawrence 6-21-90
Michael J. Lawrence, Manager Date
Department of Energy
Richland Operations Office

6/14/90
William R. Wiley, Director Date
Pacific Northwest Laboratory



Simulated High-Level Waste Slurry Treatment/Storage

Simulated High-Level Waste Slurry Treatment/Storage
Treatment Site and Equipment

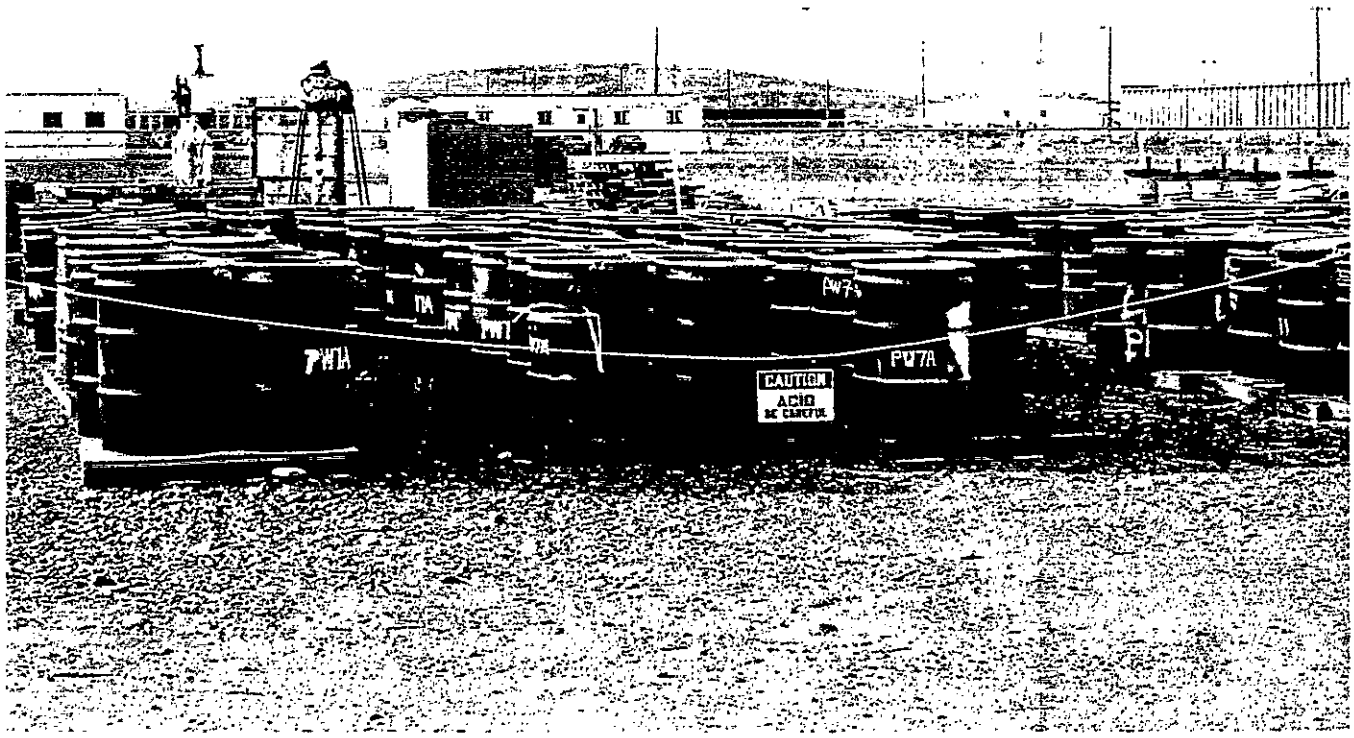


Longitude 119° 16'54"
Latitude 46° 20'52"

9004271-1CN
Photo Taken 1988

39005081.1

Simulated High-Level Waste Slurry Treatment/Storage



Longitude 119° 16'54"
Latitude 46° 20'52"

8801374-2CN
Photo Taken 1988

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2.0 FACILITY DESCRIPTION

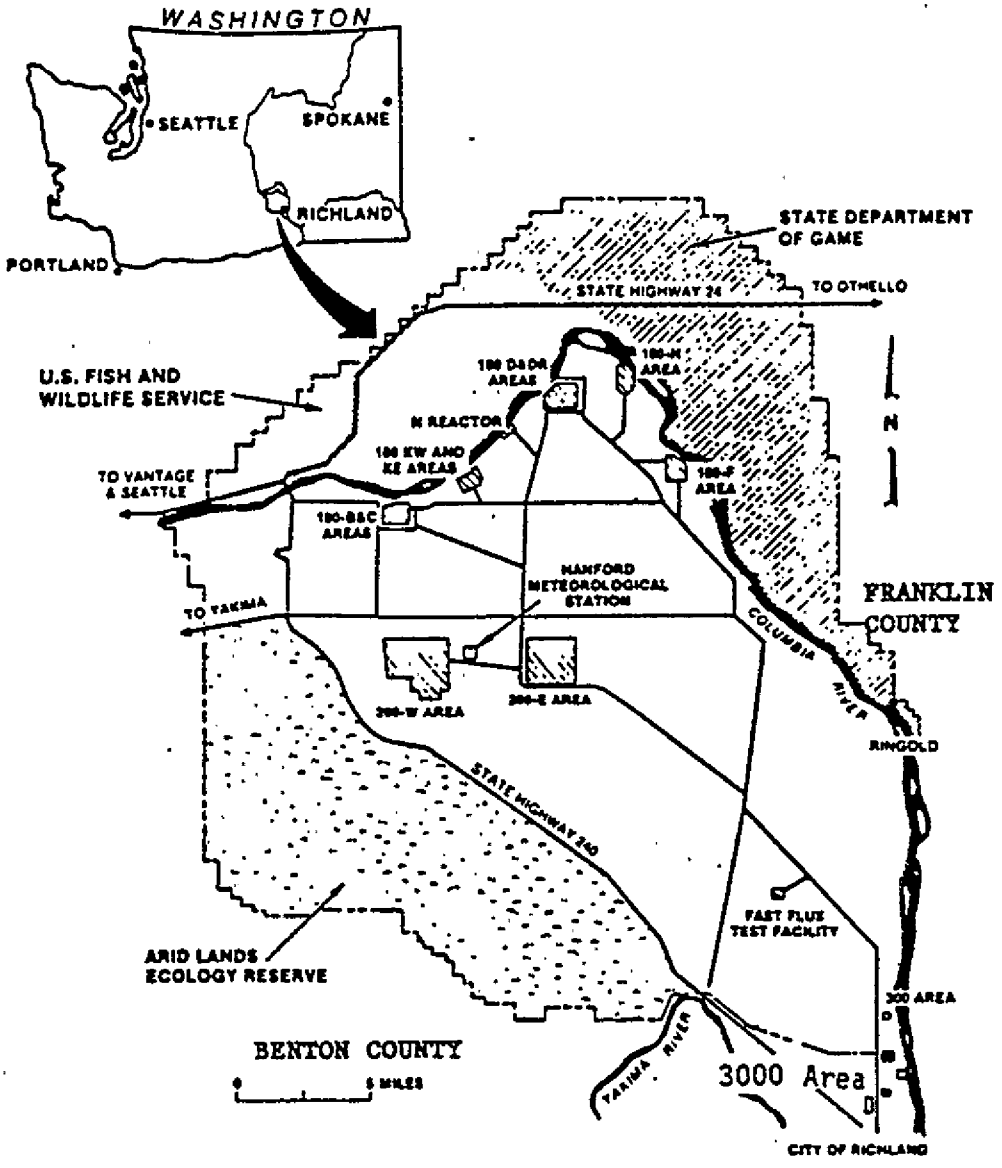
This section provides a general description of DOE's Hanford Site, the Hanford Facility, and the dangerous waste management unit discussed in this Closure Plan, and is intended to provide the permit application reviewer/permit writer with an overview of the operation and its location.

2.1 GENERAL DESCRIPTION OF THE HANFORD SITE

The Hanford Site consists of approximately 560 square miles (1,450 square kilometers) of semiarid land that is owned and operated by the U.S. Department of Energy, Richland Operations Office (DOE-RL). This site is located northwest of the City of Richland, Washington, along the Columbia River. The City of Richland lies approximately 3 mi (4.8 km) from the southernmost portion of the Hanford Site boundary and is the nearest population center (Figure 2.1). In early 1943, the U.S. Army Corps of Engineers selected the Hanford Site as the location for reactor, chemical separation, and related facilities for the production and purification of plutonium. A total of eight graphite-moderated reactors using Columbia River water for once-through cooling were built along the Columbia River. These reactors were operated from 1944 to 1971.

N Reactor, a dual-purpose reactor for production of plutonium and generation of steam for production of electricity, uses recirculating water coolant. N Reactor began operating in 1963 and is now being put into cold standby status.

Activities are centralized in numerically designated areas on the Hanford Site. The reactor facilities (in various stages of decommissioning) are located along the Columbia River in the 100 Areas. The reactor fuel processing and waste management facilities are located in the 200 Areas,



1 Figure 2.1. Surrounding Land Use

situated on a plateau about 7 mi (11.2 km) from the river. The 300 Area, located north of Richland, contains the reactor-fuel manufacturing facilities and the research and development laboratories. The 400 Area, 5 mi (8 km) northwest of the 300 Area, contains the Fast Flux Test Facility. The 3000 Area, just north of Richland, contains buildings associated with maintenance and transportation functions for the Hanford Site. The 3000 Area is not contiguous with the rest of the Hanford Site (Figure 2.1).

2.2 DESCRIPTION OF THE HANFORD FACILITY

The Hanford Facility is a single facility under the Resource Conservation and Recovery Act of 1976 (RCRA), and is identified by EPA/State Identification Number WA7890008967. The facility consists of more than 60 treatment, storage, and/or disposal (TSD) units covered by the Hanford Site Dangerous Waste Part A Permit Application. The Hanford Facility consists of the contiguous portion of the Hanford Site that contains these TSD units and that, for RCRA purposes, is owned and operated by DOE-RL. (This excludes lands north and east of the Columbia River, river islands, lands owned by the Bonneville Power Administration, lands leased to the Washington Public Power Supply System, and lands owned by or leased to the State of Washington.) The 3000 Area, in which the SHLWS T/S unit is located, is not contiguous with the Hanford Facility except for a roadway providing access to the Area. DOE recently requested that a separate dangerous waste ID number be assigned to the 3000 Area. When this ID number is granted, documents relating to the closure of this unit will be modified as appropriate.

2.3 DESCRIPTION OF THE SHLWS T/S UNIT

The SHLWS T/S unit is in an open area, within a fenced-in yard located in the 3000 Area of the Hanford Site at approximately 46°20'52" latitude and 119°16'54" longitude. The specific location of the SHLWS T/S unit within the 3000 Area is shown in Figure 2.2.

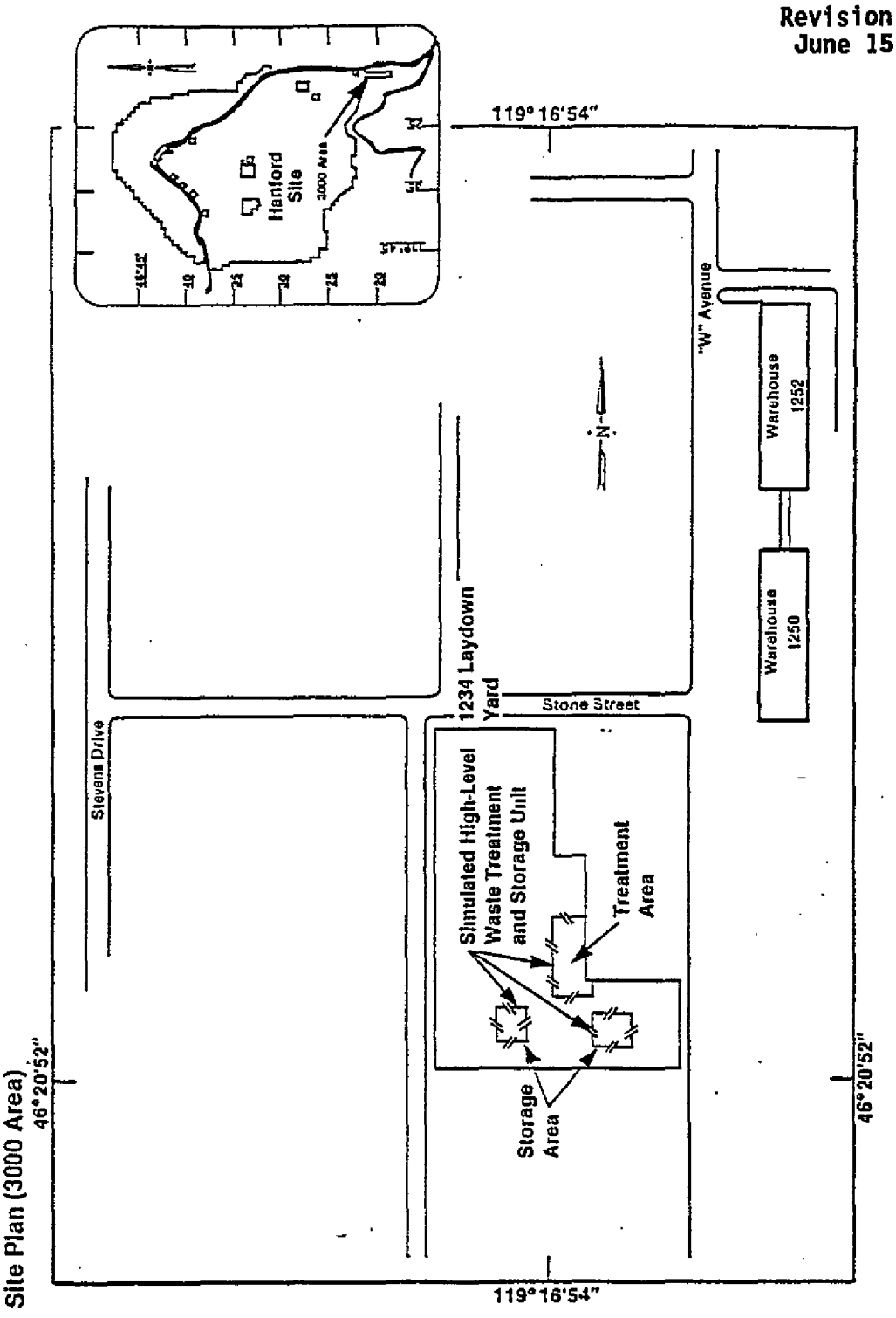


Figure 2.2. Location of SHLWS T/S Unit Within 3000 Area

The SHLWS T/S unit identified for closure is defined by roped boundaries (see Figure 2.3) and enclosed in a fenced area of approximately 86,600 square feet (8,000 square meters) in the shape of an L. The trunk of the L is aligned north-south, with a length of 449.5 ft (137 m) and a width of 187.5 ft (57 m); the base of the L joins the trunk on the southeast corner and is aligned east-west with a length of 114.0 ft (35 m) and a width of 77.5 ft (24 m). The unit is surrounded by a 6-ft (1.8-m) chain-link fence. On the western side, which is the only boundary with public access, the fence is topped with barbed wire. Access is controlled by a single 6-ft (1.8-m) locked gate, located on the eastern edge of the unit. A minimum number of keys to the locked gate are available to only those individuals who are cognizant of the special requirements for entry into the SHLWS T/S unit. Mr. H. Wayne Slater (509-376-0575), who is the Pacific Northwest Laboratory (PNL)[a] SHLWS T/S Unit Manager, enters the locked area regularly to perform inspections of the SHLWS T/S unit.

The unit is divided among cordoned areas, including one area used for storage of SHLWS in drums, another used for SHLWS treatment, and one used for accumulations of containerized dangerous wastes for less than 90 days, as shown in Figure 2.3. The areas surrounding the unit were used for nonregulated activities, including storage of raw materials and structural materials. Raw materials stored in the unit included the grout-forming chemicals used for treatment (fly ash, blast furnace slag, and Portland cement).

2.3 PHYSIOGRAPHY

Figure 2.1 is a general overview map of the entire Hanford Site property and the surrounding countryside. It provides information on major features

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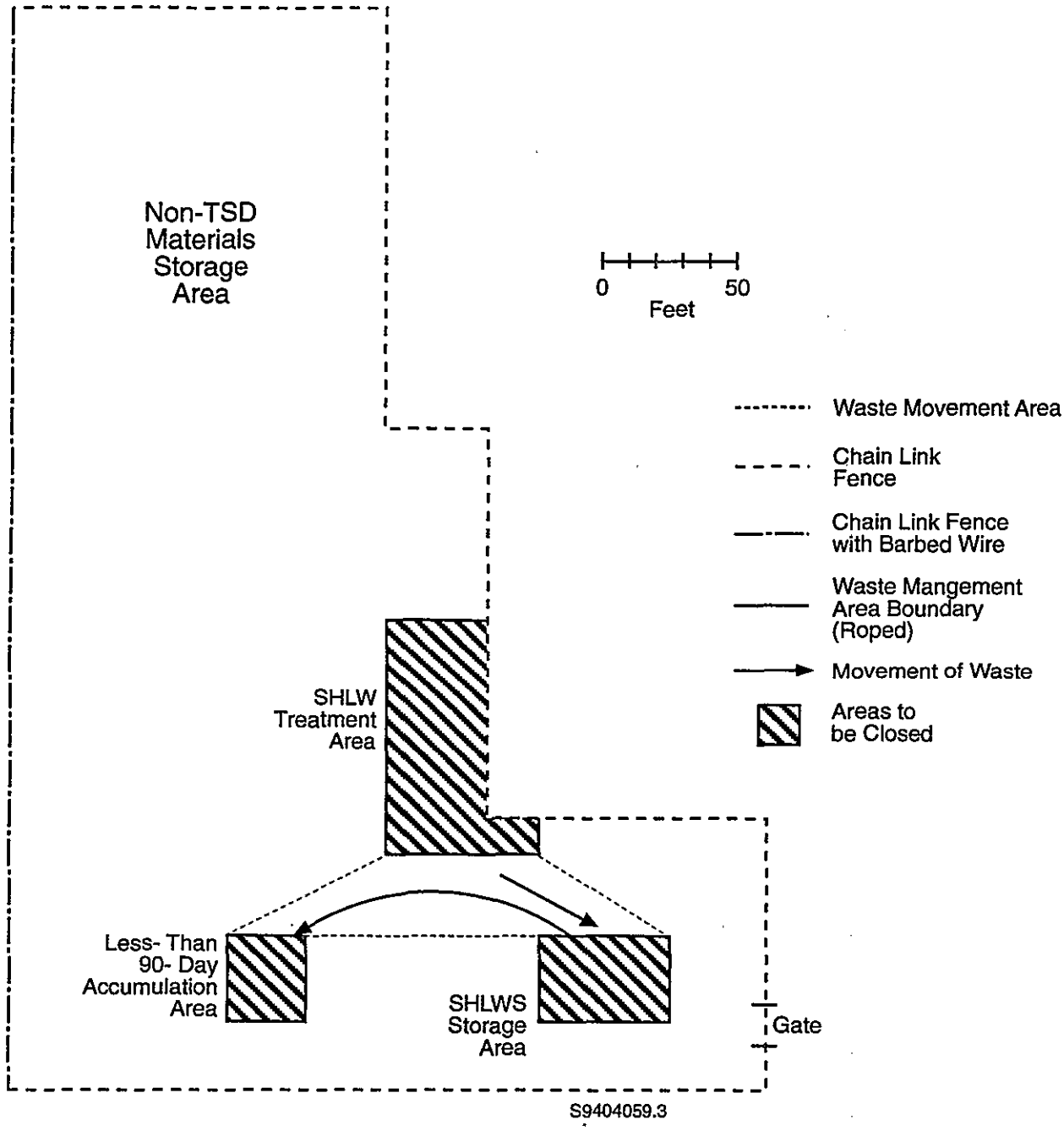
[a] Pacific Northwest Laboratory is operated for DOE by Battelle Memorial Institute under Contract DE-AC06-76RLO 1830.



1 Figure 2.3. Layout of SHLWS T/S Unit

and illustrates the facility boundary and surrounding land use, including the U.S. Fish and Wildlife Service Saddle Mountain National Wildlife Refuge and the Washington State Game Reserve to the north, and the Arid Lands Ecological Reserve to the west. Land east of the Hanford Site across the Columbia River is primarily farmland or a part of the Washington State Game Reserve.

A topographic map of the area around the SHLWS T/S unit is shown in Figure 2.4. A number of elevation reference points in the area of concern confirms the flatness of the area within 1000 feet of the unit.

A more detailed layout of nearby buildings is provided in Figure 2.2. Figure 2.5 provides wind roses for various locations on the Hanford Site based on information from the meteorological stations operated by PNL. The wind roses show the relative proportion of time that winds blow from various directions and indicate that winds on the Hanford Site are predominantly from the west.

2.4 LOCATION INFORMATION

2.4.1 Seismic Consideration

The Hanford Site is not located within any of the counties identified in Appendix VI of 40 CFR 264 and WAC 173-303-420(3)(c) as being considered to be seismically active.

2.4.2 Floodplain Standard

The U.S. Army Corps of Engineers has calculated the probable maximum flood based on the upper limit of precipitation falling on a drainage area and other hydrologic factors, such as antecedent moisture conditions, snowmelt, and tributary conditions that could lead to maximum run-off (USCOE 1969). The

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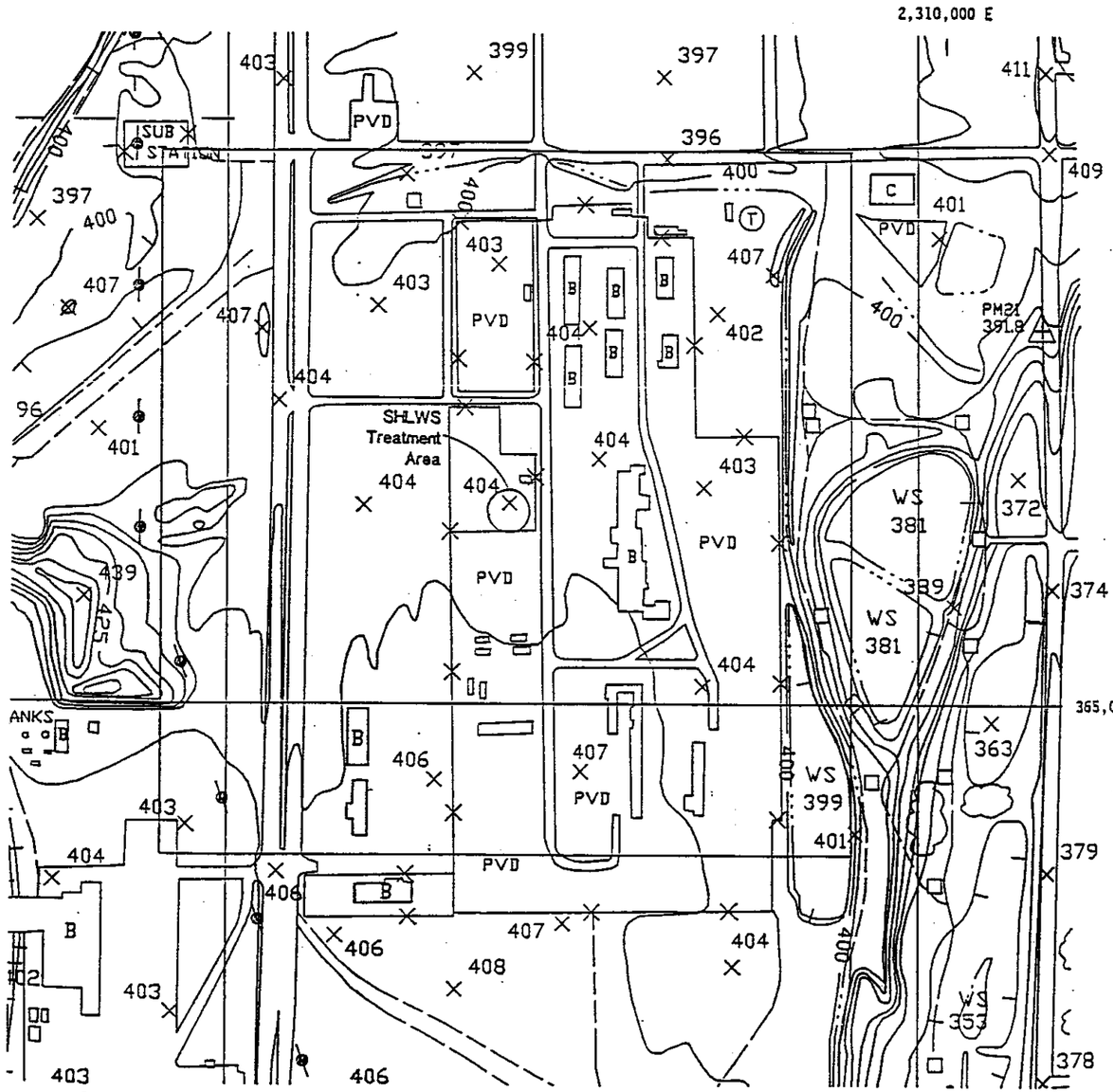

DEGROSS AERIAL MAPPING
17520 Bothell Way NE
Bothell, Wash 98011
(206) 487-2525

JOB NO. 89-373
SHEET E / ABCDE

Date of Photography: 5-30-89

5' Contours

Scale 1"=500'

LEGEND

C-Concrete
PVD-Paved
B-Building
T-Tank
WS-Water Storage

1

Figure 2.4. Topographic Map for Area near SHLWS T/S Unit

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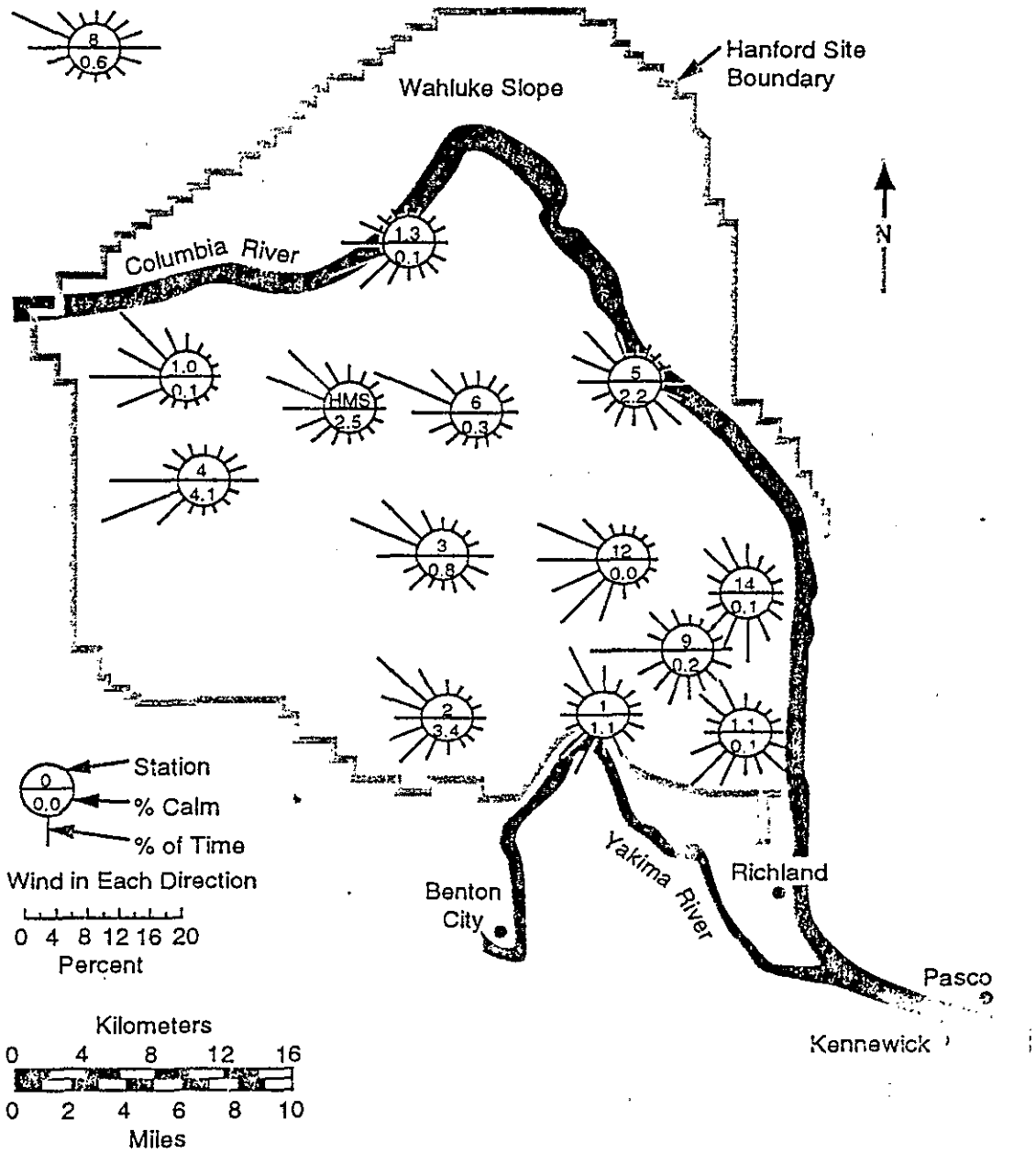


HMS = Hanford Meteorological Station

0910300...2

1 **Figure 2.5. Wind Roses for the Hanford Site**

probable maximum flood for the Columbia River below Priest Rapids Dam has been calculated to be 1.4 million cubic feet per second (40,000 cubic meters per second). This flow would result in estimated flood elevations of 423 ft (129 m) at the 100-N Area and 384 ft (117 m) at the 300 Area. The area near the 3000 Area estimated to be inundated by this flood is shown in Figure 2.6. The elevation of the SHLWS T/S unit is approximately 404 ft (123 m); the unit would not be inundated by this flood. It is noted that the area that would be inundated by this maximum probable flood is greater than the area that would be inundated during a 100-year flood.

2.5 TRAFFIC INFORMATION

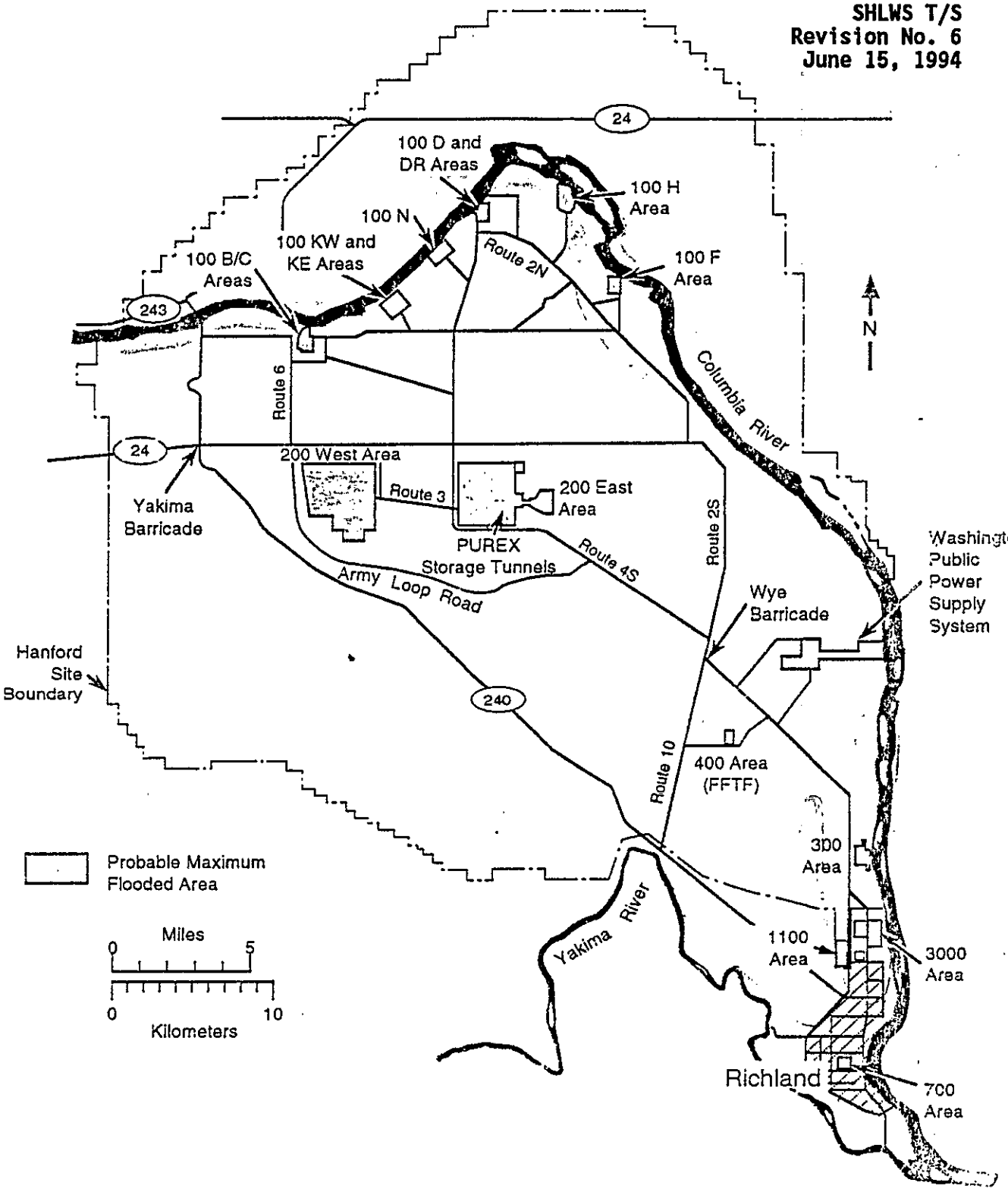
The SHLWS T/S unit is located in the 3000 Area, which is south of the Controlled Access Area of the Hanford Site. The roadways in this area are owned by DOE and accessible by the public. The roadways providing access to the 3000 Area largely receive Hanford employee traffic because of the lack of non-Hanford-related facilities in the zone between the 3000 Area and the Controlled Access Area. As a consequence, traffic consists of light-duty vehicles and employee buses. The unit itself lies within the fenced-in area managed for DOE by ICF Kaiser Hanford Company (Kaiser) on a dead-end access road (Stone Street). Access to the Kaiser-managed area is not controlled during normal working hours but is limited to authorized personnel during off-hours. The SHLWS T/S unit is removed from the major thoroughfare in the vicinity (primarily Route 4S) and does not border on general public traffic lanes. Stone Street and Stevens Drive (Route 4S) are constructed of bituminous asphalt [usually 2 in. (5 cm) thick] with an underlying aggregate base. The aggregate base consists of various types and sizes of rock found on the Hanford Site.

2.6 REFERENCES

40 CFR 264. "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

1 U.S. Army Corps of Engineers (USCOE). 1969. Memorandum Report - Lower
2 Columbia River Standard Flood Project and Probable Maximum Flood. U.S Army
3 Engineer Division, Portland, Oregon.

4 WAC 173-303. "Dangerous Waste Regulations."



1 Figure 2.6. Estimated Extent of Maximum Probable Flood H9109020.3B

3.0 WASTE CHARACTERISTICS

This section describes the characteristics of the SHLWS stored and treated at the SHLWS T/S unit. All testing was performed by or under contract to PNL and analytical records are maintained under the project file records, identified as "simulated high-level waste treatment and storage."

Specific information on the corrosivity, EP toxicity, and acute fish toxicity studies has been provided to Ecology previously, in Treatment of Excess Process Chemicals (Simulated High-Level Waste Slurry) (Lokken 1989). The results of the acute rat toxicity studies were provided to Ecology in a letter from Steven H. Wisness to Roger F. Stanley at Ecology, dated January 11, 1990.

3.1 UNTREATED WASTE CHARACTERISTICS

The SHLWS was created by blending virgin chemical products to simulate high-level wastes for use in experimental waste treatment programs. Two separate compositions of material were created by a chemical supplier (Research Chemical, P.O. Box 14588, Phoenix, Arizona 85031). These compositions were designated as PW-0 and PW-7A. A third composition consisting of 50% PW-0 and 50% PW-7A was created after receipt of the SHLWS from the supplier. The compositions of the three mixtures are given in Table 3.1. The compositions shown in Table 3.1 for PW-0 and PW-7A are the specifications that the manufacturer was required to meet. Random samples of the PW-0 and PW-7A supplied by the manufacturer were collected and analyzed by inductively coupled plasma spectroscopy (ICP; SW-846 method 6010) and atomic absorption spectroscopy (AA; SW-846 method 7470). Analytical results are shown in Table 3.2. The results in Table 3.2 indicate the presence of several elements that are not included in Table 3.1. These elements reflect impurities in the chemicals used to form the mixtures. The rare earth mixture

Table 3.1. Composition of SHLWS as Procured

Compound	Concentration (g/L) PW-0	PW-7A	50/50
$AgNO_3$	1.80	0	0.90
$BaNO_3$	37.28	0	18.64
$Cd(NO_3)_2 \cdot 4H_2O$	3.26	0	1.63
$Co(NO_3)_2 \cdot 6H_2O$	15.38	0	7.69
$Cr(NO_3)_3 \cdot 9H_2O$	25.37	0	12.69
$Fe(NO_3)_3 \cdot 9H_2O$	232.66	106.72	169.69
KNO_3	34.18	0	17.09
$NaNO_3$	0	263.15	131.58
$Ni(NO_3)_2 \cdot 6H_2O$	56.85	0	28.43
$Sr(NO_3)_2$	30.19	0	15.10
$ZrO(NO_3)_2 \cdot 2H_2O$	149.68	0	74.84
MoO_3	88.95	0	44.48
Ce	45.90	73.29	61.10
Rare earths	301.53	279.47	290.50
HNO_3	39	120	77

Note: Compositions of PW-0 and PW-7A are as specified by supplier.
Composition of 50/50 mixture is as mixed after receipt from supplier.

Table 3.2. Analyzed [by Methods 6010 (ICP) and 7470 (AA)] Composition of SHLWS

Constituent	Concentration (mg/L) PW-0	PW-7A
Aluminum	3300	6300
Antimony	(240)[a]	(200)
Arsenic	<0.2[b]	<10
Barium	4700	210
Boron	(70)	(70)
Cadmium	900	<10
Calcium	2200	2800
Cerium	40000	67000
Chromium	2600	190
Cobalt	2390	90
Copper	150	160
Dysprosium	9500	12200
Europium	200	190
Gadolinium	4000	3300
Iron	24000	13900
Lanthanum	27000	26000
Lead	(560)	(600)
Magnesium	340	870
Manganese	80	67
Mercury	0.4	0.4
Molybdenum	44000	80
Neodymium	21400	26800
Nickel	8500	100
Potassium	14000	5700
Selenium	<0.022	<10
Silicon	780	450
Silver	530	<10
Sodium	900	59500
Strontium	9000	50
Tellurium	(500)	(600)
Titanium	120	80
Yttrium	4400	5600
Zirconium	36800	2000

[a] Values in parentheses are near the detection limits.
[b] "Less than" values represent analytical detection limits.

used consisted of a naturally occurring mineral containing a variety of impurities. The pH of all three compositions was below 1.

The SHLWS met several of the criteria and characteristics for designation of dangerous wastes, as defined by Ecology. The slurries were dangerous waste mixtures (WAC 173-303-084) because of the toxicity [defined under WAC 173-303-100(a)] and concentrations of the chemical compounds used to prepare the simulated wastes. The wastes also met the dangerous waste characteristics defined in WAC 173-303-090. The wastes were considered to be ignitable [under WAC 173-303-090(5)] and corrosive [under WAC 173-303-090(6)] because the high concentration of nitric acids caused them to be classified as oxidizers and because their pH was less than 2. The wastes were also Extraction Procedure (EP) toxic [under WAC 173-303-090(8)] as a result of the concentrations of silver, barium, cadmium, lead, mercury, and chromium. The SHLWS was also subject to land disposal restrictions [RCRA Section 3004(d)(2)] because of pH and concentrations of cadmium and nickel.

The SHLWS was initially considered slightly radioactive because of naturally occurring radioactivity in the rare earth minerals used to prepare the mixtures. At the time that the SHLWS became a waste, it was considered to be a mixed waste because radiological surveys of the wastes identified levels of radioactivity above background. The exact nature of the radioactivity was not determined until the waste was sampled. Waste sampling and analysis, as described below, determined that the radioactivity was due to naturally occurring radionuclides and that the total specific activity was less than 2,000 pCi/g. As a result of the waste analysis, the SHLWS was considered to be dangerous waste rather than mixed waste. At the time of its disposal, wastes that contained NORM whose specific activity was less than 2 nCi/g were not considered radioactive.

Samples of the mixtures were analyzed for gross alpha activity, gross beta activity, and gamma-emitting radionuclides. The gross beta activity was

calculated assuming energies similar to ^{90}Sr-^{90}Y. The gross alpha activity was calculated by spiking replicate samples with a known amount of ^{242}Pu to determine absorption effects from residual salts. Results of this analysis are given in Table 3.3. The sample used to determine the radioactive constituents for the 50:50 mixture consisted primarily of sludge, which accounts for the higher values. Individual samples of PW-0 and PW-7A were homogeneous.

3.2 TREATED WASTE CHARACTERISTICS

Samples of treated SHLWS were collected during treatment and tested following completion of the curing period. The samples were analyzed for unconfined compressive strength, EP toxicity, corrosivity, and acute fish and rat toxicity. They were not analyzed for ignitability because the neutralization process chemically converted the slurry to a non-ignitable mixture. Testing of the treated SHLWS was documented in response to Ecology requests for information concerning the treatment (Majnarich and Ladiges 1989; Zabel 1989). Sampling and testing are described in detail in the document provided to Ecology (Lokken 1989). Additional supporting information related to the analytical results noted in the report by Lokken (1989) is available in the project files.

A sampling plan was developed for the treated SHLWS to ensure that at least 99.9% of the materials in the treated drums was below dangerous waste designation limits for EP toxicity and corrosivity (with 95% confidence). The number of drums to be sampled was determined based on statistical analysis of the expected variance in pH and toxic metals concentration. This analysis indicated that a minimum of 6 random samples would be required for EP toxicity analysis and 12 random samples would be required for pH analysis. The sampling plan called for sampling 24 drums at random. Half of the samples (12) were to be archived in case the wastes had greater variability than expected and additional analyses were required to obtain the desired

Table 3.3 Radiation Resulting from Radioactive Constituents in Untreated SHLWS

Constituent	Concentration (pCi/g)		
	PW-0	PW-7A	50/50
Gross Beta	82.9	66.9	129
Gross Alpha	389	150	600
Gross Gamma[a]			
^{228}Ac[b]	7.21	1.85	13.1
^{214}Bi[c]	2.21	0.70	8.23
^{223}Ra[d]	33.8	40.8	71.1
^{40}K	14.8	<0.81	6.85
Total	529.92	<261.06	828.28

(a) Gamma radiation resulting from other radioisotopes within the chains noted was below background.
(b) Thorium-232 decay chain; parent is radium-228.
(c) Uranium-238 decay chain.
(d) Uranium-235 decay chain; parent is actinium-227.

confidence interval. Of the 12 samples not archived, all 12 were to be analyzed for pH and 6 were to be analyzed for EP toxicity.

During treatment, 306 drums of treated waste were generated. Twenty-three of these drums were sampled, 11 containing PW-7A and 12 containing PW-0. The total number of samples taken from these drums was 58, consisting of 22 of PW-7A and 36 of PW-0. The number of samples analyzed was 12 of PW-7A (from 6 drums) and 12 of PW-0 (from 6 drums). All drums from which samples were analyzed received analysis for both EP toxicity and pH. The total number of drums sampled for pH, therefore, was equal to the required number of 12, and the total number of drums sampled for EP toxicity was twice the required number of 6. The results of this sampling and analysis procedure, as summarized in the following subsections, indicate that the grouted wastes in

each waste category were well below designation limits for EP toxicity and corrosivity.

3.2.1 Compressive Strength

Three samples each of the treated/solidified PW-0 and PW-7A were prepared and tested for unconfined compressive strength according to ASTM Method C-39 (ASTM 1985). Treated SHLWS samples were collected from drums after the grout chemicals had been added and blended. These samples were then poured into plastic bottles and allowed to cure for approximately 2 months before testing. The length-to-diameter ratio for each sample was 2, with nominal diameters of 1.2 in. (3.0 cm) and 1.6 in. (4.1 cm) for the PW-0 and PW-7A samples, respectively. The compressive strength of the samples averaged 770 psi (5,300 kPa) for the PW-0 samples and 540 psi (3,700 kPa) for the PW-7A samples. The Nuclear Regulatory Commission (NRC) requires a minimum compressive strength of 50 psi (340 kPa) for solidified low-level waste to ensure that the waste forms will be physically stable under lithostatic pressures exerted by the solidified waste and any cover materials. The treated SHLWS met this requirement.

3.2.2 EP Toxicity

Six samples each of solidified PW-0 and PW-7A were subjected to the EP toxicity test using a dilute acetic acid extraction (EPA Method 1310). The extracts were analyzed by PNL using ICP and AA. The analytical results are given in Table 3.4. These results indicate that the treated SHLWS was not a dangerous waste based on the EP toxicity characteristic, the standard toxicity designation test at the time the analysis was conducted.

Table 3.4. EP Toxicity Results for Solidified SHLWS

	Concentration (mg/L)							
Sample ID	As	Ba	Cd	Cr	Pb	Hg	Se	Ag
PW-0 7-3	<0.06	2.1	0.13	0.01	<0.03	<0.005	0.05	<0.02
PW-0 42-3	<0.06	2.7	0.21	0.01	<0.03	<0.005	0.04	<0.02
PW-0 75-3	<0.06	1.9	<0.005	0.02	<0.03	<0.005	0.08	<0.02
PW-0 87-3	<0.06	1.5	<0.005	0.02	<0.03	<0.005	0.08	<0.02
PW-0 104-3	<0.06	1.3	<0.005	0.02	<0.03	<0.005	0.06	<0.02
PW-0 144-3	<0.06	2.4	0.20	0.02	<0.03	<0.005	0.04	<0.02
PW-7A 171-2	<0.06	1.7	<0.005	<0.01	<0.03	<0.005	0.05	<0.02
PW-7A 191-2	<0.06	2.4	<0.005	0.01	<0.03	<0.005	0.06	<0.02
PW-7A 220-2	<0.06	1.6	<0.005	<0.01	<0.03	<0.005	0.05	<0.02
PW-7A 231-2	<0.06	1.3	<0.005	<0.01	<0.03	<0.005	0.04	<0.02
PW-7A 273-2	<0.06	2.5	<0.005	<0.01	0.04	<0.005	<0.03	<0.02
PW-7A 276-2	<0.06	2.1	<0.005	<0.01	0.04	<0.005	<0.03	<0.02
EP Toxicity Limits	5	100	1	5	5	0.2	1	5

3.2.3 Corrosivity

The corrosivity test conducted by PNL for six samples of solidified PW-0 and PW-7A was performed by adding the samples to equal weights of deionized water, mixing for 30 minutes, and measuring the pH of the resultant liquid (WAC 83-13, "Chemical Testing Methods for Complying with the Dangerous Waste Regulations," Appendix B, Attachment 3). The results of this testing are given in Table 3.5 (Zabel 1989). All results are within the allowable pH range of 2 to 12.5. These results indicate that the treated SHLWS is not dangerous based on the corrosivity characteristic.

Table 3.5. Corrosivity Test Results for Solidified SHLWS

Sample ID	pH
PW-0 7-2	11.6, 11.6, 11.6
PW-0 42-2	11.5, 11.5, 11.5
PW-0 75-2	11.5, 11.6, 11.5
PW-0 87-2	11.5, 11.5, 11.5
PW-0 104-2	11.3, 11.3, 11.3
PW-0 144-2	11.3, 11.3, 11.3
PW-7A 171-1	11.5, 11.5, 11.5
PW-7A 191-1	11.4, 11.3, 11.3
PW-7A 220-1	11.5, 11.5, 11.5
PW-7A 231-1	11.6, 11.6, 11.6
PW-7A 273-1	11.5, 11.5, 11.5
PW-7A 276-1	11.5, 11.5, 11.5

3.2.4 Acute Toxicity

The Washington State Department of Ecology concluded that the PW-0 should have been designated as extremely hazardous waste under WAC 173-303-084 and determined that successfully passing both the static acute fish toxicity test and the acute rat toxicity test specified in WAC 173-303-110(3)(ii) was required before the PW-0 could be redesignated as non-hazardous.

Acute fish toxicity (Biological Testing Method No. WDOE 80-12) was determined for a composite sample of solidified PW-0. The lethal concentration (LC_{50}) for this material was greater than 1,000 mg/L (Zabel 1989).

Acute rat toxicity (Biological Testing Method No. WDOE 80-12 Part B) was determined for two composite samples of solidified PW-0. The results

demonstrated that the lethal dose (LD_{50}) for this material was greater than 5000 mg/kg of rat body weight (Majnarich and Ladiges 1989).

3.2.5 Radioactivity

The radioactivity (gross gamma) measurements conducted by PNL on the treated PW-0 and PW-7A were 35 pCi/g and 18 pCi/g, respectively. This is significantly less than the gross gamma of the untreated slurry (see Table 3.3) because of dilution provided by addition of the grout-formers and neutralizing material. In addition, the effective radiation dose from alpha- and beta-emitters within the waste is reduced significantly by treatment because of the self-shielding effect of the grout. As shown in Table 3.3, radiation from naturally occurring radionuclides in the untreated SHLWS is well below 2,000 pCi/g. Because of dilution, the concentrations of radionuclides in the treated waste are even lower than those in the untreated waste.

3.3 REFERENCES

American Society for Testing and Materials (ASTM). 1985. "C-39-84, Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimens." 1985 Annual Book of ASTM Standards, Volume 04.02 Concrete and Mineral Aggregates. American Society for Testing and Materials, Philadelphia, Pennsylvania.

EPA Method 1310A. "Extraction Procedure (EP) Toxicity Test Method and Structural Integrity Test."

Lokken, R. O. 1989. Treatment of Excess Process Chemicals (Simulated High-Level Waste Slurry). PNL-6915, Pacific Northwest Laboratory, Richland, Washington.

Majnarich, J.J., and W. Ladiges. 1989. Rat Toxicity Test. BIOMED No. 11871 and 11872. BIOMED, Inc., Bellevue, Washington.

WAC 83-13. "Chemical Testing Methods for Complying with the Dangerous Waste Regulations."

WAC 173-303. "Dangerous Waste Regulations."

Zabel, M. L. 1989. Grout Sample Analysis for Corrosivity, EP Toxicity, and Acute Fish Toxicity. Hanford Environmental Health Foundation, Richland, Washington.

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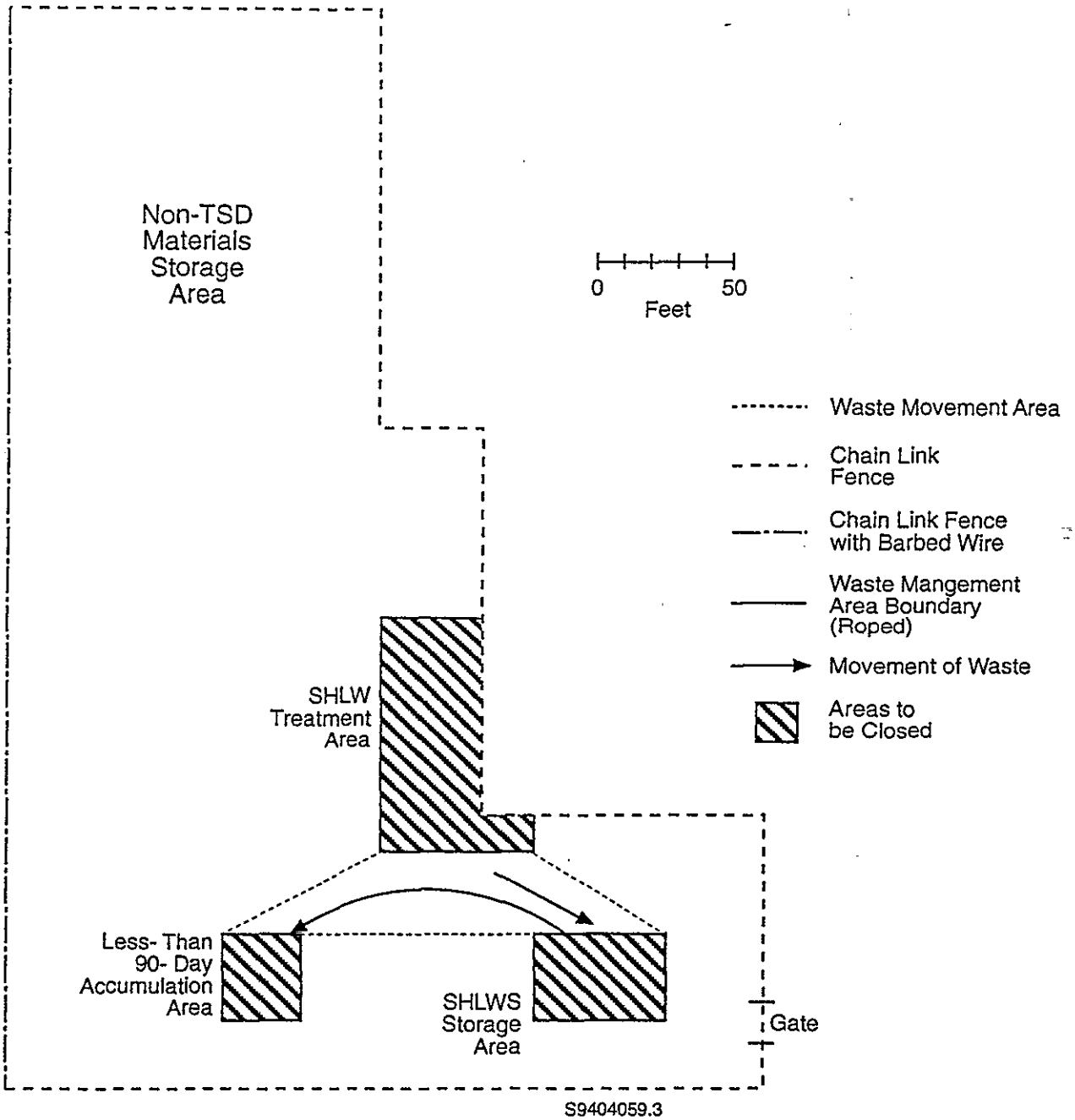
4.0 PROCESS INFORMATION

The SHLWS treatment area was used for storage of containers of SHLWS waste, for treatment of this waste by solidification/stabilization, and for the storage of drums of treated SHLWS. The waste storage and treatment areas are separate, as shown in Figure 4.1. Spatial details of the SHLWS storage area, the 90-day-or-less accumulation area, and the treatment area are provided in Figures 4.2 through 4.4, respectively. The untreated SHLWS containers consisted of 55-gal (208-L), polyethylene-lined, carbon steel drums, which were stored on pallets. The palletized drums were stored in two vinyl-lined storage areas having 4-in. (10-cm) spill containment curbs, as shown in Figure 4.2. Because of the corrosive nature of the SHLWS, some of the drums had corroded. Secondary containment was provided for these corroded drums by wrapping them with polyethylene and placing them in "Spil-Tainer" polyethylene containers. Each "Spil-Tainer" contained one drum; these were stored in a separate, unlined area, as shown in Figure 4.2.

During operations, the following equipment was used at the unit:

- Air compressor. This rented equipment was decontaminated and returned to the vendor.
- Air mixers. These remain at the site.
- Air hose. The air hose remains at the site.
- Stainless steel spill containment or drip pans. Most of the pans remain at the site; one pan was used for secondary containment during the neutralization cooling process and was decontaminated and removed from the site for reuse.
- Polyvinyl chloride (PVC) liners. The liners were put into barrels and sent to a regulated disposal site.
- Polyethylene carboys. The empty carboys, which originally contained NaOH, were rinsed and disposed of as nonregulated material.
- Fork-lift truck. No decontamination was necessary, and the truck was removed from the site.



1 Figure 4.1. Layout of SHLWS Storage and Treatment Areas

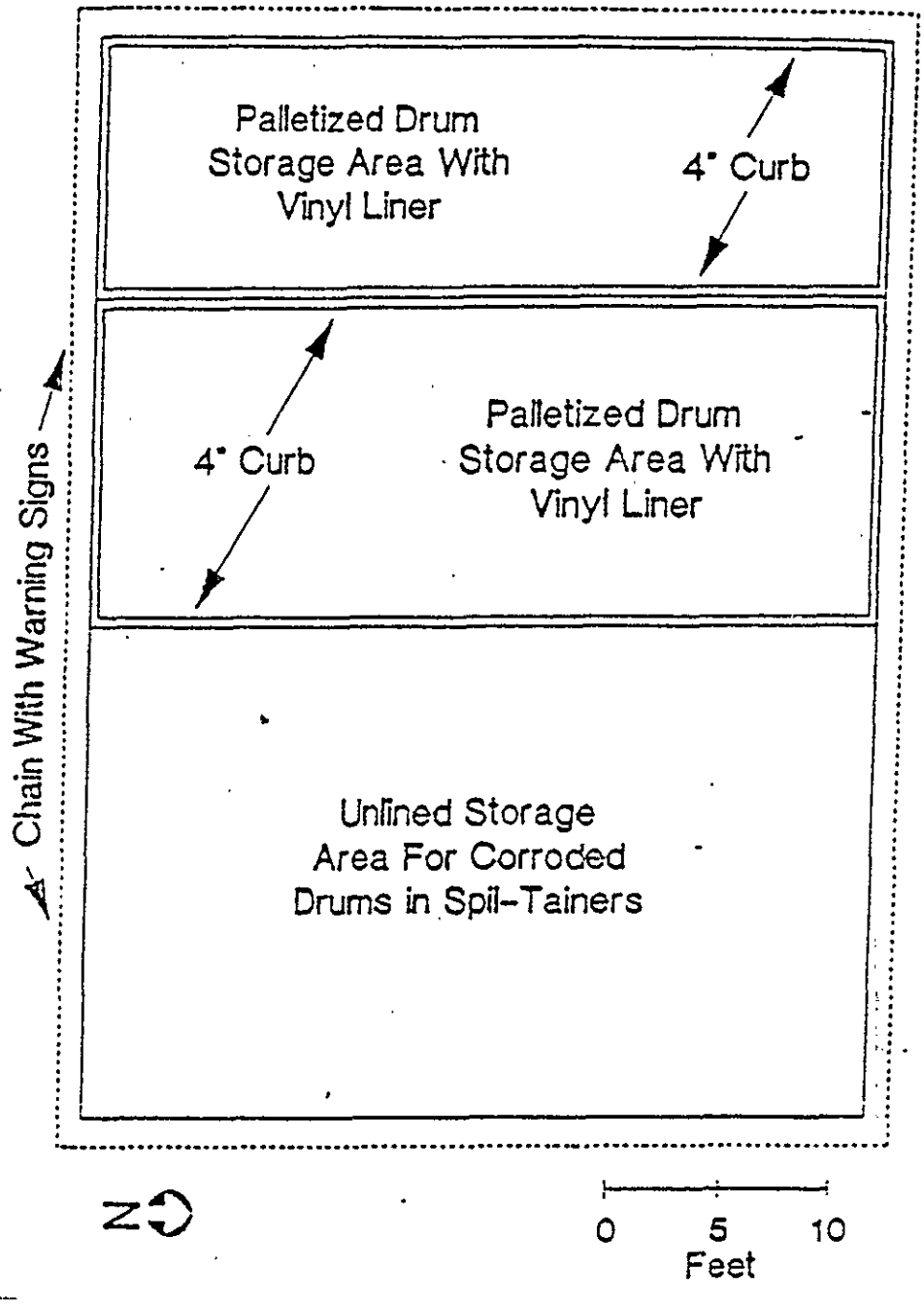
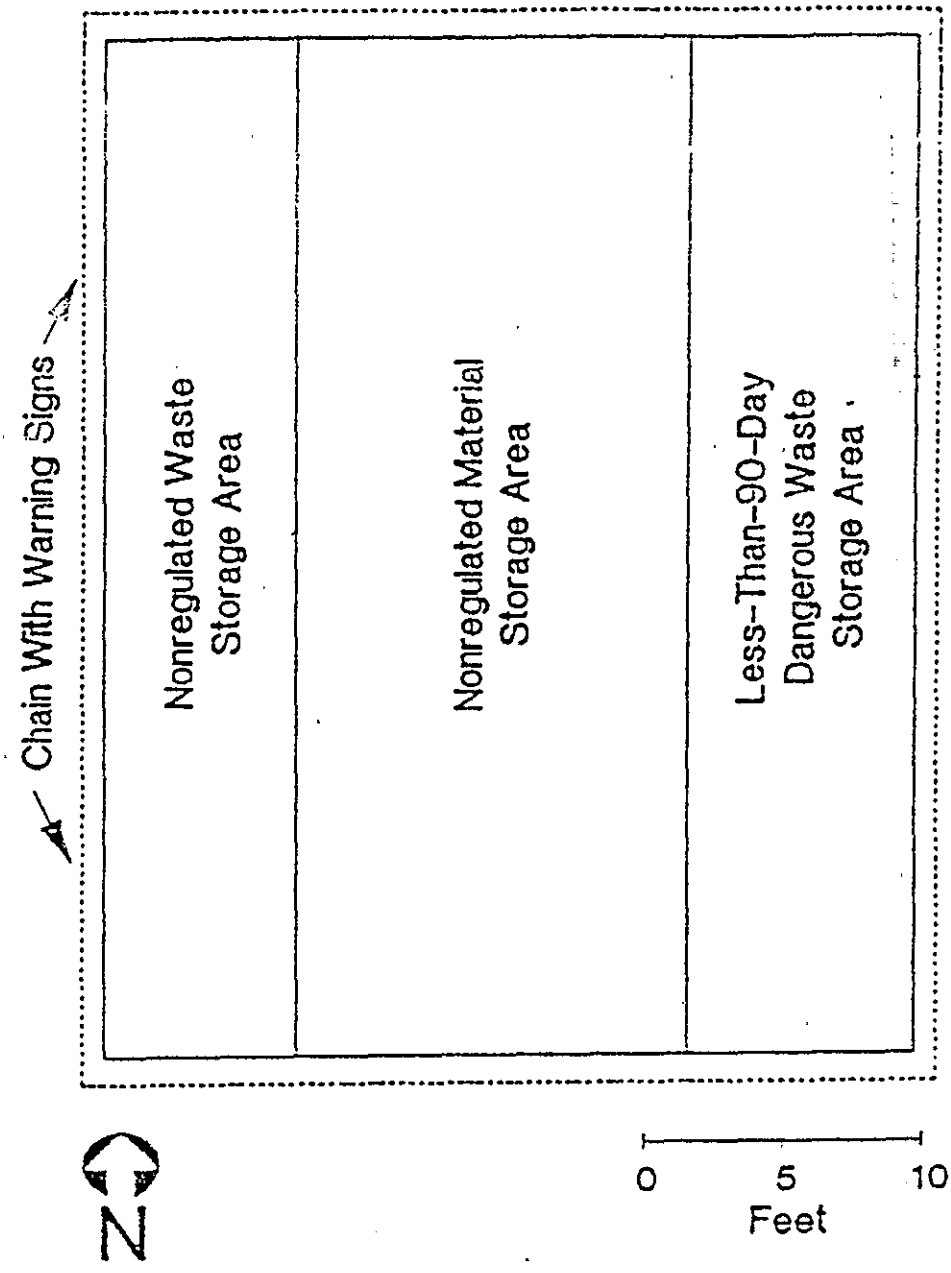


Figure 4.2. Details of the SHLWS Storage Area



1 Figure 4.3. Details of the 90-Day-or Less Accumulation Area

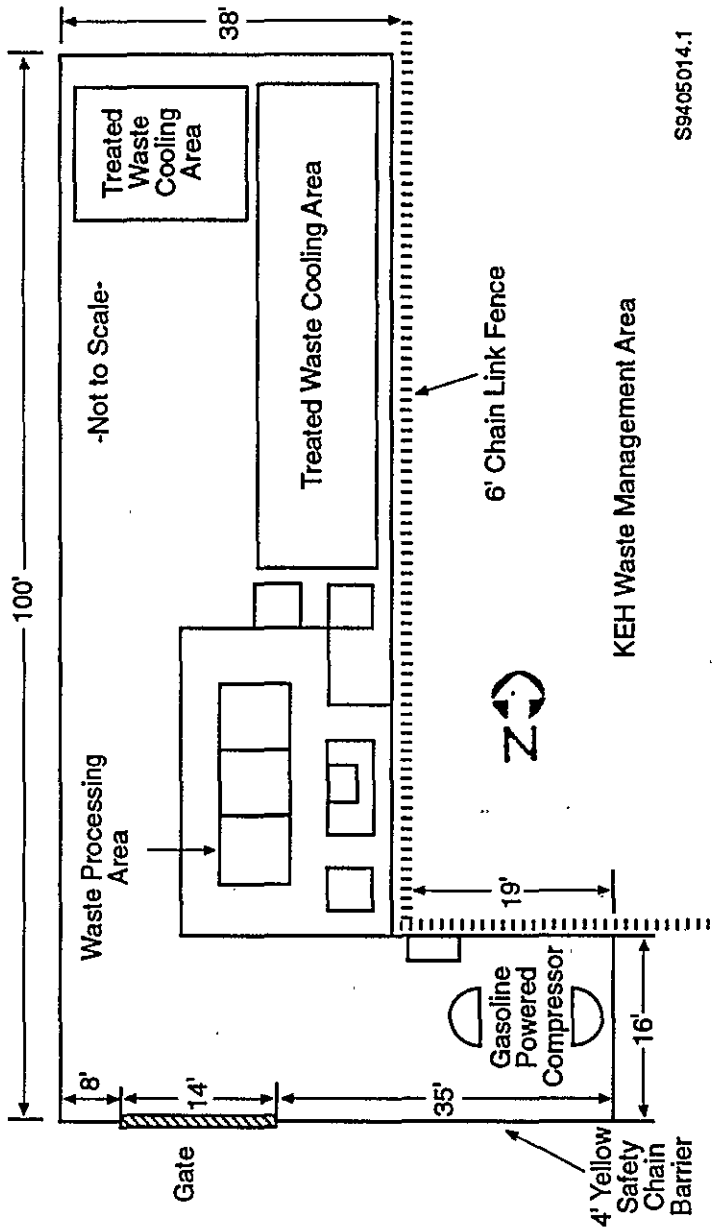


Figure 4.4. Details of the SHLWS Treatment Area

- Pallets. These remain at the site.
- Miscellaneous small implements. Many of these remain at the site; those that do not remain were grouted with the decontamination wastes.

Treatment of the SHLWS was conducted in a separate area (Figure 4.1) that is roped off and identified by warning signs. The SHLWS treatment process is summarized as follows:

1) A full pallet of four SHLWS drums was transferred by fork-lift truck from the storage area to the treatment area and placed in a stainless steel spill containment pan.

2) The lids of the drums were removed and the contents homogenized by mixing with an air-driven drum mixer. The contents of each drum were adjusted to approximately 34 gal (130 L) by pumping excess homogenized mixture into empty or partially filled polyethylene-lined drums.

3) The pH of the waste mixture was adjusted to pH 6±0.5 by addition of 50% NaOH (19 M). The caustic was added at a rate of approximately 0.5 gal/min (2 L/min) while mixing the slurry with an air-driven drum mixer. During caustic addition, the temperature of the slurry was monitored and caustic addition stopped if the temperature reached 85°C.

4) Following neutralization, the lid of the drum was replaced. When a pallet of drums had been neutralized, the pallet was transferred to a temporary storage area to allow the drums to cool to below 45°C (approximately 24 hours). The temporary storage area is adjacent to the mixing area and is lined with a 30-mil (0.076-cm) PVC liner, which is curbed to provide spill containment and to control run-on and run-off.

5) Once the drums had cooled, the pallet was transferred back to the mixing area and placed in the spill pan. The drum lid was removed and the contents of the drum mixed with the air-driven drum mixer. The grout was formed by addition of one 80-lb (36-kg) bag of fly ash, one 90-lb (41 kg) bag of blast furnace slag, and one 94-lb (43-kg) bag of Portland cement.

6) A sample of grout was obtained at random from approximately one of every 12 drums of grout. The sampling frequency was selected based on a statistical analysis of sample rates necessary to provide 95% confidence that 99.9% of the treated drum contents would have the same characteristics as the analyzed samples. Samples were collected using a composite liquid waste sampler (COLIWASA). After sampling, the slurry samples were poured into plastic bottles for curing prior to testing.

These samples were tested for EP toxicity, corrosivity, and acute fish and rat toxicity to verify that stabilization of the wastes had occurred and that hazardous constituents were not leachable from the treated wastes at levels of concern.

7) Following addition of the grout-forming chemicals, the drums were resealed and transferred to the temporary storage area for curing. The lids were temporarily left unsealed to eliminate the potential for pressure buildup caused by volume changes during curing.

8) Once the treated slurry was hardened, the drum lids were secured and the pallet of drums was transferred back to the SHLWS storage area.

During treatment, waste was moved from the storage area directly to the treatment area and back by fork-lift truck. There was no known spillage or leakage during the transfers, and therefore the fork-lift truck and associated equipment did not require decontamination. Any outer garments and small equipment contaminated by grout were added to the grout. Before the drums were moved, their lids were replaced and sealed, even though their stay in the area was expected to be short (e.g., the duration of the neutralizing/cooling period).

Before grouting, the PW-0 material was moved from the north boundary of the 90-day-or-less accumulation area to the north boundary of the storage area by fork-lift truck. One leak of approximately 10 gal (38 L) of PW-0 occurred on the east edge of the 90-day-or-less accumulation area (referred to as the SW spill). The spilled material and contaminated soil were removed down to dry earth and put into drums. This contaminated soil was added to the grout. The PW-0 had been stored at the location before establishment of the 90-day-or-less accumulation area in the summer of 1987, at which time it was included with the PW-7A at the single bermed storage area.

One spill involving about 20 gal (76 L) of PW-7A occurred just north of the storage area when a drum was being moved to be used for experimental purposes (referred to as the NE spill). All potentially contaminated soil was removed, put in barrels, and later grouted.

Additional information describing the waste treatment process and actions and administrative procedures to safeguard staff, the public, and the environment was noted in the "RCRA Plans 'Compliance Notebook' for Simulated High-Level Waste Treatment/Storage." This document contained plans for the SHLWS T/S unit required under WAC 173-303, including a waste analysis plan, security plan, general inspection plan, training plan, preparedness and prevention plan, contingency plan, emergency plan, facility record-keeping plan, and facility reporting plan. The Compliance Notebook was maintained at the unit while material was stored there. A copy of the current version of this document is available for review through the PNL unit manager.

4.1 REFERENCES

WAC 173-303. "Dangerous Waste Regulations."

5.0 GROUNDWATER MONITORING

The need for groundwater monitoring at the SHLWS T/S unit will be dependent on the requirements under 40 CFR 265 Part F in relation to the actual closure status of the SHLWS T/S unit when closure activities are complete. Initially a two-phase sampling strategy, as described in the SAP, Appendix A, will be undertaken to determine the presence of any contamination. If contamination is found, a strategy for Phase II will be developed to determine the extent of contamination, what remedial activities would be practicable, and what verification sampling would be required to ensure that the performance standard for closure (MTCA-B or MTCA-C) has been met.

5.1 REFERENCES

40 CFR 265. "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

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6.0 CLOSURE AND POST-CLOSURE REQUIREMENTS

Prior to treatment by the solidification/stabilization process, the untreated SHLWS was originally designated as a mixed waste and later as a dangerous waste, a Part A, Form 3 Permit Application was submitted, and the unit operated under interim status standards. As required under Section 6.3 of the Hanford Federal Facility Agreement and Consent Order Action Plan, the SHLWS T/S unit will be closed under interim status standards in WAC 173-303-610. The treated wastes have been removed from the unit and disposed of, and the unit has not been used for any additional dangerous or mixed waste management activities since that time.

The purpose of this section is to demonstrate that the DOE-RL and PNL have developed a plan to ensure safe closure of the unit and adequate post-closure care in accordance with applicable regulations. Closure activities, beginning with soil sampling, will commence within four weeks of the approval of the sampling and analysis portion of this plan. The closure activities will be conducted in accordance with the closure schedule described in Section 6.3.1.8.

To aid in the evaluation of this Closure Plan, it has been organized corresponding to the headings of the closure/post-closure checklist given in the EPA, Office of Solid Waste's Protocol for Evaluating Interim Status Closure/Post-Closure Plans. Reference is made to applicable sections of WAC 173-303 and 40 CFR 265.

6.1 GENERAL CLOSURE REQUIREMENTS

To ensure that the closure of the SHLWS T/S is accomplished consistent with applicable regulatory requirements, the existing compliance notebook for the unit will be updated to address specific requirements pursuant to closure activities at the unit. The compliance notebook is an internal PNL document,

required by DOE-RL, that outlines how PNL will comply with applicable regulations within WAC 173-303-280 through -400 for an ongoing TSD activity. The compliance notebook will continue to be available for review at the unit or within the office of the PNL contractor representative (Hanford Site, Building 324, Room 179) until closure has been completed.

6.1.1 Partial and/or Final Closure Activities [40 CFR 265.111 and 265.112, WAC 173-303-610(2),(3)]

This Plan presents the activities required for final closure of the SHLWS T/S unit at its maximum extent of operation. Partial closure will not be conducted. Closure activities are presented in sufficient detail so that the closure process is understandable and a closure schedule can be developed.

6.1.1.1 Closure Performance Standard [40 CFR 265.111, WAC 173-303-610(2)]

The SHLWS T/S unit will be closed in a manner that will minimize the need for further maintenance and will minimize or eliminate post-closure release of dangerous wastes or dangerous waste constituents that could pose a risk to human health or the environment. This standard will be met by removal of all dangerous wastes and dangerous waste residuals from the site. All SHLWS stored at the unit was treated, using the process described in Section 4.0 of this Plan, and removed from the unit for final disposition; the treated PW-7A waste was sent to the Central Hanford Landfill and the treated PW-0 waste was sent to the regulated landfill in Arlington, Oregon. The treated PW-7A was declared nonhazardous on September 29, 1989 (letter from Roger Stanley, Ecology, to Roger Freeberg, DOE-RL). The treated PW-0 was declared nonhazardous on April 17, 1990 (letter from Timothy L. Nord, Ecology, to Steven Wisness, DOE-RL).

During closure, all equipment remaining at the unit will be decontaminated if necessary, using the procedures described in Section 6.1.1.5

of this Plan, and removed from the unit for final disposition. Sampling and excavation equipment will be decontaminated and removed as described in Section 6.3.2. All residuals resulting from decontamination will be evaluated and removed from the unit for final disposition in accordance with local, state, and federal regulations. If practicable, contaminated soils will be removed from the unit so that dangerous waste residuals in soils remaining onsite are below the levels specified in WAC 173-303-610(2)(b) and WAC 173-340-740 Method B.

Levels of contaminants in soils will be determined through sampling and analysis as described in the Sampling and Analysis Plan (SAP, Appendix A). These levels will be used to determine whether the closure performance standards under WAC 173-340-740 Method B have been met. If it is determined to be impractical to remove all such contaminated soils or other dangerous waste residuals, such that the requirements of WAC 173-303-610(2)(b) and WAC 173-340 Model Toxics Control Act (MTCA) Method B standards for soil are not met, a process of identifying data quality objectives for final closure will be used as discussed in Section 6.3.1.8 and Appendix A.

6.1.1.2 Contents of Plan [40 CFR 265.112(b), WAC 173-303-610(3)(a)]

This Plan identifies the steps necessary to perform final closure of the unit. The Plan identifies how the SHLWS T/S unit will be closed to meet the closure performance standard given in Section 6.1.1.1. Section 6.1 addresses general regulatory requirements for the closure of treatment, storage, and 90-day-or-less accumulation areas. Section 6.2 addresses general post-closure requirements, which are not currently applicable because it is not planned to close the SHLWS T/S unit as a unit requiring post-closure care. Section 6.3 describes the procedures that will be undertaken to close the treatment and container storage areas at the SHLWS T/S unit, including removal or decontamination of equipment, and removal of any contaminated soils. Closure

requirements in Sections 6.4 through 6.10 are not applicable because they address other types of units.

6.1.1.2.1 Maximum Inventory of Wastes, Removal of Wastes [40 CFR 265.112(b)(3), WAC 173-303-610(3)(a)(iii),(iv)]

Before treatment operations began, the SHLWS T/S unit contained 100 drums of PW-0 waste, 98 drums of PW-7A waste, 1 drum of 50% PW-0 and 50% PW-7A waste, and 11 drums of secondary waste. The secondary waste included drum liners, absorbent, and soil from cleaning up spills prior to grouting. Because of the additional volume associated with treatment, the 199 original drums of SHLWS resulted in a total of 306 drums of treated waste. No other wastes were added to this inventory, which represents the maximum inventory of dangerous wastes formerly onsite in the SHLWS container storage area during the active life of the unit.

The SHLWS T/S unit also includes a 90-day-or-less accumulation area that was formerly used to accumulate dangerous wastes in drums. The maximum inventory of wastes stored in this area at any one time was 79 drums. The 90-day-or-less accumulation area is currently inactive, and all wastes accumulated in this area have been removed. The closure of the 90-day-or-less accumulation area will be addressed in this plan.

After the PW-0 SHLWS was repacked into 55-gal (208-L) drums and moved to the East Storage Area, the West Storage Area was set up as a 90-day-or-less waste accumulation area for 18 months. During those 18 months, a variety of dangerous and extremely hazardous waste materials not related to the SHLWS were temporarily held at the site, pending shipment for disposal at the 616 Nonradioactive Dangerous Waste Storage Facility in the 600 Area. Except for four 55-gal barrels of dilute water mixtures, two containing isopropyl alcohol and two containing ethylene glycol, the material consisted primarily of solid-

material mixtures of metal nitrates, oxides, and hydroxides. The material held at the area included the following:

Miscellaneous Material

Floor sweepings containing dirt, oil, and sawdust (some of the materials listed below were also included in these sweepings)

Lagging, glass frit, gravel, and ash

Inorganic Material

Aluminum phosphate

Acids: boric, nitric, phosphoric

Carbonates: K, La, Li, Na, Nd

Fluorides: Ca, La, Nd

Sodium compounds not noted below: aluminate, borate, chloride, formate, fluoride, molybdate dihydrate, nitrite, oxalate, phosphate

Phosphorous pentoxide

Dysprosium

Tellurium metal

Zeolites IE-95,96

Metal hydroxides: Al, Ca, Ce, Cr, Cu, Fe, K, La, Mg, Mn, Mo, Na, Nd, Ni, P, Pr, Si, Sr, Sm, Li, Y, Zr

Metal nitrates: Al, B, Ba, Ca, Cd, Ce, Co, Cr, Cu, Fe, Gd, K, La, Li, Ma, Mg, Mn, Mo, Na, Nd, Ni, Sr, Y, Zr

Metal oxides: Ag, Al, B, Ba, Ca, Cd, Ce, Co, Cr, Cs, Cu, Fe, Gd, K, La, Li, Mg, Mn, Mo, Na, Ni, P, Pr, Re, Ru, Si, Sm, Sr, Ti, Y, Zn, Zr

Metal sulfates: Al, Ba, Cu, Fe, Na

Organic Material

Sugar

Ethylene glycol/water mixture

Isopropyl alcohol/water mixture

Detailed waste shipping records for the material processed through the 90-day-or-less waste accumulation area have been provided to Ecology and are included within the project administrative files. There were no reported spills at the facility and all material had been removed prior to initiation of treatment activities.

The SHLWS storage area, SHLWS treatment area, and 90-day-or-less waste accumulation area (see Figure 2.3) represent the maximum extent of the unit (used for dangerous waste management) that was operational during its active life.

The process used to treat the SHLWS is described in Section 4.0. Methods used for removing, transporting, storing, or disposing of all dangerous wastes prior to closure are described in Section 6.3 for the container storage areas and treatment area.

6.1.1.2.2 Removal and Decontamination Procedures [40 CFR 265.112(b)(4)), WAC 173-303-610(3)(a)(v)]

Steps used in removing or decontaminating all dangerous waste residues and contaminated equipment are described in Section 6.3 for the container storage areas and treatment area.

6.1.1.2.3 Other Activities During Closure Period [40 CFR 265.112(b)(5); WAC 173-303-610(3)(a)(vi)]

This Closure Plan for the SHLWS T/S unit is based on removal of all dangerous wastes and dangerous waste residues. Control of run-on and run-off will be accomplished by performing closure activities (e.g., equipment decontamination) within bermed collection areas or drip pans. All liquids collected in the bermed collection areas or drip pans will be managed as

liquid decontamination wastes, as described in Section 6.3.2.2. Other activities, such as groundwater monitoring and leachate collection, are currently not addressed because they are not required for container storage areas under WAC 173-303-645 and WAC 173-303-630, respectively. If, during implementation of this Closure Plan, it becomes evident that all dangerous waste residuals cannot be practicably removed, other closure activities will be identified and this Closure Plan will be amended.

6.1.1.2.4 Closure Schedule [40 CFR 265.112(b)(6),(7), WAC 173-303-610(3)(a)(vii)]

Closure of the SHLWS T/S unit was originally scheduled to begin in 1990. The schedule for closure activities is discussed in Section 6.3.1.8.

6.1.1.3 Amendment of Closure Plan [40 CFR 265.112(c), WAC 173-303-610(3)(b)]

No changes in unit design are expected that would require amendment to the Closure Plan. Unexpected events (e.g., discovery of dangerous waste residuals that cannot be removed) could occur during implementation of closure activities. If so, notification will be made to EPA and Ecology within 30 days of such an unexpected event. The PNL Unit Manager will be responsible for amendment of the Plan. The amended Plan will be submitted to EPA and Ecology by DOE-RL and PNL.

6.1.1.4 Notification of Closure [40 CFR 265.112(d), WAC 173-303-610(3)(c)]

This Closure Plan was originally submitted to EPA and Ecology in September 1989. That deadline for submission corresponded to Interim Milestone M-20-19 of the Action Plan for Implementation of the Hanford Federal Facility Agreement and Consent Order (Action Plan). Under the terms of this agreement, as specified in Appendix B of the Action Plan, submittal of this

Closure Plan satisfies all requirements for notification of closure. Further operation of the SHLWS T/S unit is not planned and the unit will be closed.

6.1.1.5. Closure Activities Performed Before or After Notification of Closure [40 CFR 265.112(e), WAC 173-303-610(3)(c)(iv)]

The treated SHLWS wastes have been removed and disposed of at a facility authorized to receive wastes. The T/S area liner material has been removed and disposed of as a dangerous waste. Information concerning treatment of the SHLWS and the characteristics of the treated wastes was submitted to Ecology by DOE-RL and PNL in June 1989. Approval for disposal of the grouted material as non-dangerous waste was received in letters from Roger Stanley of Ecology to Roger Freeberg of DOE and from Timothy L. Nord of Ecology to Steven H. Wisness of DOE on September 25, 1989, and April 17, 1990, respectively. Approval to dispose of the liner material as dangerous waste was received from Ecology on April 11, 1990. Concurrence from Ecology to remove "legacy equipment" at the unit was received in a letter from Greta P. Davis of Ecology to Steven H. Wisness of DOE-RL, dated June 7, 1994, and so the equipment currently remaining at the unit will be removed. The equipment and the decontamination and removal actions are as follow:

Pallets	Currently, 102 pallets are located in the treatment and southeast storage areas. The 55 pallets in the southeast area were used for SHLWS in barrels, before and after grouting. Pallets in the treatment area were used to store barrels of grouted material until they were shipped for disposal. Pallets evidencing only a rust ring will be disposed of as non-regulated solid waste. If pallets show any discoloration other than a rust ring, the discolored portions will be cut out and managed as dangerous waste, or the entire pallet will be cut up and managed as dangerous waste. The dangerous waste will be transported to a Resource Conservation and Recovery Act (RCRA) permitted Treatment, Storage and Disposal (TSD) Facility. Parts of the pallet showing no discoloration will be disposed of as solid waste in accordance with local, state and federal regulations.
Tables	Two tables are located within the 90-day-or-less waste accumulation area and the treatment area. They were used primarily as working tables to record data, maintain an

inventory of container-labeling supplies, and prepare labels. A metal table in the treatment area was also used as a work table to facilitate use of the air-driven pumps, motors, and agitators. The tables did not have any contact with dangerous waste or hazardous materials at the unit. The steel table at the treatment site will be excessed, and the small table at the 90-day-or-less accumulation area will be disposed of as solid waste in accordance with local, state, and federal regulations.

Air Hose — Several lengths of air compressor hose are located in the treatment area. The hose supplied air to the grout-mixing motors and pumps used to transfer neutralizing solution (NaOH) to the grout material and did not come into contact with the dangerous waste or hazardous materials. It will be disposed of as solid waste in accordance with local, state, and federal regulations.

Mixing Motors — Three mixing motors and agitators are located in the treatment area. They contain only residue of the grouted waste. The grout was not designated as a dangerous waste and therefore the mixing motors and agitators will be disposed of as solid waste in accordance with local, state, and federal regulations.

Small Tools — Small implements such as scoops, screw drivers, hand brooms, and three small pumps use for transferring NaOH will be disposed of as solid waste in accordance with local, state, and federal regulations.

Drip Trays — Five stainless steel drip trays are located in the treatment area. They will be washed with a non-phosphorous detergent and rinsed with deionized water. The rinsate will be collected, sampled, analyzed for heavy metals by procedures 6010, 7421 (lead), 7471 (mercury), and screened for total activity. If the rinsate is determined to be non-dangerous, the drip trays will be retained for use as a secondary containment system or disposed of as solid waste in accordance with local, state, and federal regulations. If the rinsate is determined to be dangerous, the trays will be washed and rinsed a second time. If the second rinsate is designated as a dangerous waste by procedure 6010, the trays will be managed as dangerous waste or the cycle of decontamination and analysis of rinsate repeated until the rinsate is determined to be non-dangerous. Any dangerous waste will be transported to an appropriate RCRA TSD Facility.

In accordance with DOE requirements, all samples, material, and equipment that is removed from the unit will be field-surveyed to detect any radioactive contamination. Any samples, material, or equipment showing evidence of radioactive contamination will be disposed of as low-level or radioactive mixed waste as appropriate.

6.1.2 Time Allowed for Closure [40 CFR 265.113, WAC 173-303-610(4)]

6.1.2.1 Extension of Closure Time Frame [40 CFR 265.113(a),(b), WAC 173-303-610(4)(a),(b)]

All dangerous wastes have been treated, rendered nondangerous, and removed from the unit, with the exception of equipment that is potentially contaminated by residuals and equipment that cannot be decontaminated, which will be disposed of as regulated waste. The closure activities described in Section 6.3.1.8 of this Plan are expected to be completed within 180 days following approval by Ecology. No extension to the time frame for initiation and completion of closure is currently expected to be necessary. If a an extension is requested, it will be made consistent with WAC 173-303-610(4)(b).

6.1.2.2 Time Frames for Demonstrations for Extensions [40 CFR 265.113(c), WAC 173-303-610(4)(c)]

Extensions to the time frames for closure would be necessary only if unexpected conditions were encountered during closure of the unit. If it becomes apparent that closure cannot be completed within 180 days after regulatory approval has been granted, EPA and Ecology will be so notified at least 30 days prior to expiration of the 180-day period. This notification will explain why more than 180 days is required for closure and will demonstrate that steps have been taken to prevent threats to human health and the environment and that the unit is in compliance with applicable interim status standards. The PNL unit manager will be responsible for preparing the notification that will be submitted by PNL and DOE-RL.

6.1.3 Disposal or Decontamination of Equipment, Structures, and Soils [40 CFR 265.114, WAC 173-303-610(5)]

Steps for disposing of or decontaminating all contaminated equipment, structures, and soils are described in Section 6.3.2 for the container storage areas and treatment area.

6.1.4 Certification of Closure [40 CFR 265.115, WAC 173-303-610(6)]

Within 60 days of completion of the final closure activities described in this Plan, a certification of closure will be submitted to EPA and Ecology. The certification will indicate that the SHLWS T/S unit has been closed as described in this Plan and that the closure performance standards given in Section 6.1.1.1 have been met. The certification will be submitted by registered mail and will be signed by the Manager of DOE-RL (or his authorized representative) and by an independent professional engineer registered in the State of Washington.

The DOE-RL will engage an independent professional engineer registered in the State of Washington to certify that the SHLWS T/S unit has been closed in accordance with this Closure Plan. The DOE-RL will require the engineer to sign the following document or a document similar to it:

> I, (name), a certified professional engineer, hereby certify, to the best of my knowledge and belief, that I have made visual inspection(s) of the Simulated High-Level Waste Slurry Treatment and Storage Unit at the 3000 Area and that closure of the aforementioned unit has been performed in accordance with the attached approved Closure Plan. (Signature, date, Washington State Professional Engineer license number, business address, and phone number).

6.1.5 Post-Closure Notices [40 CFR 265.119, WAC 173-303-610(10)]

6.1.5.1 Record of Wastes [40 CFR 265.119(a), WAC 173-303-610(10)(a)]

This Closure Plan does not currently call for the SHLWS T/S unit to be closed as a dangerous waste disposal unit; therefore, submission of records of the types, locations, and quantities of dangerous wastes disposed of is not required. If, during closure, it is determined that it is necessary to close any areas as dangerous waste disposal units, the Closure Plan will be amended. Under the amended Plan, the PNL unit manager would be responsible for assembling and maintaining such records. These records would be submitted by PNL and DOE-RL to Ecology, EPA, the City of Richland, and Benton County.

6.1.5.2 Notice in Deed [40 CFR 265.119(b), WAC 173-303-610(10)(b)]

This Closure Plan does not currently call for the SHLWS T/S unit to be closed as a dangerous waste disposal unit; therefore, submission of notice to be placed in the deed of the property describing use of the land for disposal of dangerous wastes is not required. If, during closure, it is determined that it is necessary to close any areas as dangerous waste disposal units, the Closure Plan will be amended. The amended Plan would include preparation of an appropriate notice for the property deed to ensure that future land uses are compatible with maintenance of the integrity of the closed disposal units.

6.1.5.3 Certification of Notice [40 CFR 265.119(b)(2), WAC 173-303-610(10)(b)(ii)]

If a notice to the property deed is required under an amended Closure Plan, as described in Section 6.1.5.2, a certification will be made on preparation of this notice. This certification will include a copy of the

property deed containing the notice. The certification will be signed by DOE-RL and submitted to Ecology and EPA.

6.1.6 Closure Cost Estimate [40 CFR 265.142, WAC 173-303-620(3)]

In accordance with 40 CFR 264.140 (c) and WAC 173-303, this section is not required for federal facilities. The SHLWS T/S unit is a federally owned facility of which the federal government is an operator, and this section is therefore not applicable to the SHLWS T/S unit.

6.1.8 Financial Assurance for Closure [40 CFR 265.143, WAC 173-303-620(4)]

In accordance with 40 CFR 264.140 (c) and WAC 173-303, this section is not required for federal facilities. The SHLWS T/S unit is a federally owned facility of which the federal government is an operator, and this section is therefore not applicable to the SHLWS T/S unit.

6.1.9 Liability Requirements [40 CFR 265.147, WAC 173-303-620(8)]

In accordance with 40 CFR 264.140 (c) and WAC 173-303, this section is not required for federal facilities. The SHLWS T/S unit is a federally owned facility of which the federal government is an operator, and this section is therefore not applicable to the SHLWS T/S unit.

6.2 GENERAL POST-CLOSURE CARE REQUIREMENTS [40 CFR 265.117 - 265.120, 265.144, 265.145; WAC 173-303-610(7),(8),(11), -620(5),(6)]

As currently described in this Closure Plan, the SHLWS T/S unit will not be closed as a dangerous waste disposal unit. As a result, post-closure care requirements are not applicable per 40 CFR 265.110(b) and WAC 173-303-610(1)(b). If, during closure, it is determined that all dangerous waste residues cannot practicably be removed, the Closure Plan will be amended and

additional procedures developed for meeting the closure performance standard given in Section 6.1.1.1. These additional procedures may require post-closure care. If so, a post-closure plan will be prepared that addresses the applicable requirements of 40 CFR 265.117 through 40 CFR 265.120 and WAC 173-303-610(7) through WAC 173-303-610(11). The post-closure plan will be prepared by DOE-RL and PNL, reviewed by the City of Richland, and submitted to EPA and Ecology within 90 days of determination of the need for such a plan. Preparation of the plan will be the responsibility of PNL and DOE-RL.

It is noted that if a post-closure plan is necessary, a post-closure cost estimate (40 CFR 265.144) and a financial assurance mechanism for post-closure care (40 CFR 265.145) will not be required because federal facilities are exempted from those requirements per 40 CFR 265.140(c).

6.3 CLOSURE OF CHEMICAL, PHYSICAL, AND BIOLOGICAL TREATMENT UNITS

6.3.1 Contents of Plan [40 CFR 265.112(b), WAC 173-303-610(3)(a)]

This Plan addresses closure activities for the active portions of the SHLWS unit. These areas include the container storage area, the 90-day-or-less waste accumulation area, and the treatment area at the SHLWS T/S unit. It is noted that a closure plan is not strictly required for the 90-day-or-less waste accumulation area. However, the 90-day-or-less accumulation area was used to store PW-0 before it was established as a 90-day-or-less accumulation area. This Plan, therefore, addresses removal of dangerous wastes and dangerous waste residuals from both of these container storage areas to demonstrate compliance with WAC 173-303-610(2) and (5).

6.3.1.1 Description of How Each Area Will Be Closed [40 CFR 265.112(b)(1), WAC 173-303-610(3)(a)(i)]

Each area of the SHLWS T/S unit will be closed by removal of all dangerous wastes and dangerous waste residues.

- All SHLWS has been treated and the treated wastes have been removed for disposal prior to beginning closure.
- A vinyl liner beneath the drum storage area was removed and disposed of as a dangerous waste.
- All dangerous waste containers at the 90-day-or-less accumulation area have been removed from the SHLWS T/S unit.

Soils beneath the SHLWS drum storage area, the 90-day-or-less accumulation area, and the treatment area will be sampled and analyzed as described in the SAP (Appendix A). Removal of any contaminated soils will be determined by the analytical criteria, as described in the SAP (Appendix A). If, during closure, it is determined that all dangerous waste residues cannot practicably be removed, the Closure Plan will be amended and additional procedures will be developed for meeting the closure performance standard given in Section 6.1.1.1.

Performance of these closure activities will be the responsibility of PNL. The activities will be completed by staff who have undergone 40-hour hazardous waste health and safety training meeting the requirements of 29 CFR 1910.120. Staff onsite will wear personnel protective equipment specified in a Health and Safety Plan to be approved by the PNL Laboratory Safety Department prior to beginning closure.

6.3.1.2 Description of How Final Closure Will Be Conducted [40 CFR 265.112(b)(2), WAC 173-303-610(3)(a)(ii)]

Because of the condition of the vinyl liner at the SHLWS storage area and the difficulty associated with decontamination, the liner material was disposed of rather than decontaminated. The liner was cut into strips approximately 30 in. (76 cm) wide and rolled to fit into an open-top 55-gal (208-L) drum. Each drum was filled with liner material, sealed, labeled, manifested, and transported to a permitted TSD unit. Removal of other heavy equipment is described in Section 6.1.1.5.

Removal of contaminated soils is described in Section 6.3.1.6.

Following completion of all closure activities, closure will be certified, as described in Section 6.1.4.

6.3.1.3 Identification of the Maximum Extent of Operation [40 CFR 265.112(b)(2), WAC 173-303-610(3)(a)(ii)]

The SHLWS storage area and 90-day-or-less waste accumulation area (see Figure 2.3) represent the maximum extent of the unit used for storage of dangerous and mixed waste containers. These two areas occupy approximately 1,800 and 1,100 square feet (160 and 100 square meters), respectively.

The SHLWS treatment area (see Figure 2.3) represents the maximum extent of the unit used for dangerous waste treatment. This area occupies approximately 4,100 square feet (380 square meters). All SHLWS has been treated and removed, and the treatment area will not be used for additional waste treatment. The treatment area will be used during closure for decontamination of the equipment used in closure of the storage areas. For this reason, closure of the treatment area (i.e., removal of liners) will follow closure of the storage areas.

Contiguous to the southern border of the treatment area and the northern borders of both the 90-day-or-less accumulation area and the storage area was a zone through which materials were transported, as discussed in Section 4.0 and illustrated in Figure 4.1. This zone represents the maximum extent of the area involved in the movement of treated and untreated SHLWS between the treatment area, the 90-day-or-less accumulation area, and the storage area.

6.3.1.4 Estimate of the Maximum Inventory of Dangerous Wastes [40 CFR 265.112(b)(3), WAC 173-303-610(3)(a)(iii)]

Prior to beginning treatment, the SHLWS container storage area contained 100 drums of PW-0, 98 drums of PW-7A, 1 drum of 50% PW-0 and 50% PW-7A, and 11 drums of secondary waste (drum liners, absorbent, soil). The 199 drums of SHLWS and 11 drums of secondary waste have been solidified within 306 drums. The characteristics of these wastes are described in Section 3.0. These characteristics indicate that the solidified wastes are not dangerous. No additional wastes will be added to this inventory prior to closure. This inventory (63.7 m^3) represents the maximum inventory of dangerous wastes stored at the SHLWS container storage area during the active life of the unit. The maximum inventory of dangerous wastes stored in the 90-day-or-less accumulation area was 79 drums (13,500 L). All wastes have been removed from the currently inactive 90-day-or-less accumulation area, as described in Section 6.3.1.5.

The SHLWS treatment area was used to treat 199 55-gal (208-L) drums of SHLWS whose characteristics are described in Section 3.0. No other wastes were treated at this area during its active life.

6.3.1.5 Detailed Description of Removal of Waste Inventory [40 CFR 265.112(b)(3), WAC 173-303-610(3)(a)(iv)]

Drums of treated SHLWS have been removed from the storage area. The treated wastes were loaded onto a truck and transported to a solid waste landfill authorized to receive such wastes, as described in Section 6.1.1.1.

All drums at the 90-day-or-less accumulation area have been transferred to the 616 Non-Radioactive Dangerous Waste Storage Facility, which is operated by Westinghouse Hanford Company (WHC) and permitted under interim status for storage of dangerous wastes. These drums were sealed and labeled according to the requirements of PNL procedural manuals and applicable U.S. Department of Transportation (DOT) and dangerous waste regulations.

Most of the treated SHLWS was removed from the temporary storage area following solidification and transferred back to the SHLWS storage area. Some treated SHLWS was stored at the treatment area. The drums of treated waste have been removed from the unit and taken to a facility authorized for disposal of these wastes (see Section 6.1.1.1). This waste removal occurred prior to beginning closure and is not considered to be a closure activity (see Section 6.1.1.5).

During closure activities, drums of liquid decontamination wastes and other wastes (e.g., protective clothing, contaminated soil) will be generated. Removal and management of these wastes are described in Section 6.3.2.2.

6.3.1.6 Detailed Description of Removal of Waste Residues [40 CFR 265.112(b)(4), 265.114, WAC 173-303-610(3)(a)(v)]

Dangerous waste residues at the SHLWS T/S unit are expected to consist of soils contaminated by past leakage from containers. Soils that have some areas of visible discoloration will be sampled and, if they are found to be

contaminated, removed. Additional soil samples will be taken from areas of known spillage and analyzed for the hazardous constituents described in the SAP (Appendix A). A sampling program, as described in the SAP (Appendix A), will be used to determine whether the remaining soils meet the closure performance standard given in Section 6.1.1.1. It is currently expected, based on observations of the areas, that any significant contamination will be limited to surface soils. Shallow [3 to 9 in. (7.5 to 22.5 cm)] contaminated soils will be excavated by hand or using a backhoe, depending on extent, and transferred to 55-gal (208-L) open-top drums. Drum-loading operations will be conducted over reinforced polyethylene tarps to contain any soil that may be spilled and to prevent further soil contamination. After all drums are loaded, the tarps and any soil residuals on them will be put into drums. All drums will be sealed, labeled, and manifested in accordance with applicable DOT and dangerous waste requirements, and transferred to a RCRA-permitted TSD unit. Prior to excavation, the soils will be analyzed for total activity (gross alpha, beta, and gamma) to ensure that the site activity falls within applicable DOT shipping requirements. In the unlikely event that total activity analyses exceed background levels, further isotopic analysis will be performed to determine whether the increased activity is representative of the previously identified naturally occurring isotopes.

Equipment present at the SHLWS treatment area includes air-driven mixers and other equipment contaminated with treated SHLWS residuals. Removal of that equipment is described in Section 6.1.1.5. As described in Section 3.0, the treated SHLWS is a nondangerous waste. Equipment contaminated with treated SHLWS only, and which PNL does not intend to reuse, will be disposed of as nondangerous solid waste. Other equipment will be disposed of as dangerous waste or will be decontaminated as described in Section 6.3.2.1. Equipment not in contact with the hazardous waste will be disposed of as solid waste.

Dangerous waste residues in the form of contaminated soil are not expected to be found in the treatment area. The treatment area was designed to contain spills without contamination of soil. If, after removal of the liner, it becomes evident that a release had not been properly contained and that soil contamination has occurred, visibly contaminated soils will be removed. (All spills were cleaned up immediately after their occurrence.) Soils at the treatment area will be sampled as described in the SAP (Appendix A) to verify removal of contamination.

Removal of contaminated soil sufficient to meet the closure performance standard will be verified through the sampling and analysis program described in the SAP (Appendix A). Sampling and analysis will be conducted according to a Quality Assurance Project Plan (QAPjP) (Appendix B) prepared in accordance with "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAM-005/80 (Stanley and Verner 1983).

Following confirmation analysis, excavated soil will be replaced with clean fill and the site graded to return it to its original state.

If the analyses indicate that the closure performance standard has not been met, the Closure Plan will be amended. The amended Plan will include methods for further characterizing the extent of soil contamination and for removal or stabilization of the contaminated soil to meet the closure performance standard given in Section 6.1.1.1. If sampling and analysis results are suggestive of the potential for deep soil contamination, the amended Plan will also address characterization of possible groundwater contamination and will include a groundwater monitoring plan to assess groundwater contamination if necessary.

6.3.1.7 Detailed Description of Other Necessary Activities [40 CFR 265.112(b)(5), WAC 173-303-610(3)(a)(vi)]

The closure of the SHLWS T/S unit is based on removal of all dangerous wastes and dangerous waste residues. Other activities (such as groundwater monitoring, leachate collection, and run-on and run-off control) are not expected to be necessary based on current knowledge. If, during implementation of the Closure Plan, it becomes evident that all dangerous waste residuals cannot be practicably removed, the Closure Plan will be amended and other closure activities will be identified.

6.3.1.8 Schedule for Closure of the SHLWS Unit [40 CFR 265.112(b)(6), WAC 173-303-610(a)(vii)]

The schedule for closure will depend on the results obtained during the Phase I sampling, as described in the SAP (Appendix A). Once sampling has been initiated, PNL anticipates two weeks for sampling, four weeks for analysis, and three weeks for data review. Following this review period, PNL, DOE, and Ecology will determine whether the SHLWS unit can be clean-closed under MTCA-B standards. If it cannot, a process of identifying data quality objectives similar to that used for Phase I sampling will be initiated to develop the closure criteria for Phase II. Included in this process will be the development of a more detailed schedule that incorporates remedial activities (if appropriate), public comment, regulatory approval, and final certification.

6.3.2 Decontamination Procedures [40 CFR 265.112(b)(4), 265.114, WAC 173-303-610(3)(a)(v), (5)]

Decontamination efforts during closure of the SHLWS T/S unit may involve decontamination or disposal of sampling equipment and soil excavation equipment. Removal of contaminated soil was described in Section 6.3.1.6.

Management of wastes generated during decontamination is described in Section 6.3.2.2.

6.3.2.1 Procedures for Cleaning Equipment and Removing Contaminated Soils [40 CFR 265.112(b)(4), WAC 173-303-610(3)(a)(v)]

Nondisposable sampling equipment, spill pans, and any other small nondisposable equipment that comes into contact with dangerous wastes will be decontaminated at the container storage areas immediately after use. Decontamination will be performed as follows:

1) Equipment will be given a radiological survey to determine whether it is radioactively contaminated. Radiological surveys will be performed using procedures specified in PNL's procedures for radiation protection technologists. Separate decontamination lines will be used for radioactively contaminated equipment and other equipment, and decontamination wastes from these two lines will be segregated. The two lines will use identical decontamination procedures.

2) Equipment will be thoroughly scrubbed using a laboratory nonphosphate detergent such as Alconox until all signs of contamination are removed.

3) Equipment will be thoroughly rinsed with clean tap water, until it is certain that no detergent is left on the equipment.

4) Equipment will be given a final rinse with deionized water. Samples of rinse water will be collected periodically for equipment blanks to verify decontamination.

5) If the equipment is not to be used immediately, it will be allowed to air dry and will be wrapped with aluminum foil, with the dull side of the foil toward the equipment.

6) All equipment will be surveyed by a radiation protection technologist (RPT) as required by PNL-approved procedures for radiation protection technologists.

All decontamination wastes will be collected in polyethylene-lined drums or polyethylene carboys. Polyethylene is compatible with the dilute detergent

that will be present in the decontamination wastes. Decontamination wastes (e.g., rinse water) will be segregated and placed in separate containers.

Large contaminated equipment from the container storage areas (e.g., excavation equipment) will be decontaminated at the SHLWS treatment area over stainless steel drip pans or a plastic-lined bermed containment area.

To minimize generation of decontamination wastes, disposable tools and equipment will be used to the extent possible. The disposable equipment will be collected in polyethylene-lined drums or roll-off boxes for disposal as dangerous waste.

Removal of contaminated soils was described in Section 6.3.1.6.

6.3.2.2 Management of Generated Wastes [40 CFR 265.114, WAC 173-303-610(5)]

Wastes that may be generated during closure of the SHLWS T/S unit include personnel protective clothing, liners used to control spills during decontamination and drum-loading operations, soil contaminated with dangerous waste constituents, disposable equipment, liquid decontamination wastes, and pallets (if not previously removed). A satellite accumulation area will be established to store any wastes that are generated during closure activities. The waste will be managed in accordance with the generator accumulation requirement in WAC 173-303-200. Soils and liquid decontamination wastes will be sampled according to the SAP (Appendix A) to determine whether they are dangerous wastes. Wastes in drums that are designated as dangerous wastes will be properly labeled and manifested and shipped to a permitted storage area (i.e., 616 Building or 305-B Building). Container management procedures for dangerous wastes will be conducted in accordance with 40 CFR 262 and WAC 173-303-170 through -190. Solid wastes that are nondangerous will be disposed of at a facility authorized to receive such waste. Liquid wastes that are

nondangerous may be disposed of to the 300 Area process sewer or to the City of Richland sewer system with prior approval of the City. A request for such disposal, including an analysis of the wastes, will be made to the City.

Personnel protective clothing will be collected in drums. Prior to placement in drums, the clothing will be radiologically surveyed as required by PNL's procedures for radiation protection technologists. All waste protective clothing will be handled as dangerous waste.

Disposal of the liner from the drum storage area was described in Section 6.3.1.2, and the preclosure disposal of legacy equipment, such as pallets, tables, air hoses, mixing motors, small tools, and drip pans, was discussed in Section 6.1.1.5.

Soils contaminated with dangerous waste residues will be placed in drums and disposed of as dangerous waste or solid waste, depending on the waste designation. The designation of soil wastes will be based on the results of the soil sampling and analysis described in the SAP (Appendix A).

Liquid decontamination wastes will be sampled and analyzed as described in the SAP (Appendix A) to determine the proper method of management. Sampling will not be performed if the wastes can be designated as dangerous wastes based on some other means (e.g., generator knowledge). These wastes may be managed as dangerous or nondangerous-nonradioactive solid wastes or as mixed waste.

6.3.2.3 Methods for Sampling and Testing to Demonstrate Success of Decontamination [40 CFR 265.112(b)(4), WAC 173-303-610(3)(a)(v)]

Decontamination of sampling equipment will be verified by analysis of the final decontamination rinse water, as described in the SAP (Appendix A). All equipment will be radiologically surveyed following decontamination to

verify that all radioactivity is below release limits given in PNL's radiation-protection manuals.

The effectiveness of the removal of contaminated soils will be based on sampling and analysis, as described in the SAP (Appendix A).

6.3.2.4 Criteria for Determining the Extent of Decontamination Necessary [40 CFR 265.112(b)(4), WAC 173-303-610(3)(a)(v)]

Criteria for decontamination will depend on the type of material being decontaminated. All nondisposable sampling equipment will be decontaminated following use, primarily to avoid cross-contamination of samples. All other equipment that comes into contact with dangerous wastes will be decontaminated. All soils shown by sampling and analysis to be contaminated will be removed.

6.4 CLOSURE OF TANKS

These requirements are not applicable to the SHLWS T/S unit.

6.5 CLOSURE OF SURFACE IMPOUNDMENTS

These requirements are not applicable to the SHLWS T/S unit.

6.6 CLOSURE OF WASTE PILES

These requirements are not applicable to the SHLWS T/S unit.

6.7 CLOSURE OF LAND TREATMENT UNITS

These requirements are not applicable to the SHLWS T/S unit.

6.8 CLOSURE OF LANDFILLS

These requirements are not applicable to the SHLWS T/S unit.

6.9 CLOSURE OF INCINERATORS

These requirements are not applicable to the SHLWS T/S unit.

6.10 CLOSURE OF THERMAL TREATMENT UNITS

These requirements are not applicable to the SHLWS T/S unit.

6.11 REFERENCES

29 CFR 1910.120. Occupational Safety and Health Administration, U.S. Department of Labor. "Hazardous Waste Operations and Emergency Response." July 1, 1992.

40 CFR 262. "Standards Applicable to Generators of Hazardous Waste."

40 CFR 265. "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

Stanley, T. W., and S. S. Verner. 1983. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. QAMS-005/8, EPA-600/4-83-004, Environmental Protection Agency, Washington, D.C.

RCRA Section 3004(u). "Continuing Releases at Permitted Facilities." 1993.

WAC 173-303. "Dangerous Waste Regulations."

WAC 173-340. "Model Toxics Control Act."

APPENDIX A
SAMPLING AND ANALYSIS PLAN (SAP)

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A.1 TITLE PAGE

SAMPLING AND ANALYSIS PLAN (SAP)

SIMULATED HIGH LEVEL WASTE SLURRY TREATMENT AND

STORAGE (SHLWS T/S) UNIT CLOSURE

A.2 TABLE OF CONTENTS

Table	Title
A.1	Sampling Location Constituent List
A.2	Sample Analysis Methods and Samples to Be Taken for Each Contaminant of Concern
A.3	Number and Depth of Samples
A.4	Analysis Limits

A.3 CLOSURE ACTIVITIES

This appendix describes the proposed sampling and analysis activities for the SHLWS T/S unit. In conformance with Section 6.0 of the body of the closure plan, this appendix identifies specific field sampling and laboratory analytical procedures that will be applied to identify soil contamination (if any) that originated at the SHLWS T/S unit. When reviewed, the analytical results will be used to determine the appropriate closure strategy (as discussed in Section 6.0).

This sampling and analysis plan was developed based on a data quality objectives process facilitated by MAC Technical Services Company (MACTEC), general services support contractor, with the concerned parties being the U.S. Department of Energy (DOE), the Washington State Department of Ecology (Ecology), and Pacific Northwest Laboratory (PNL). The meeting minutes, including dates and attendees, statements of the problems and decisions to be made, key analytes of concern, decision logic and thresholds, and the sampling approach, are provided in Appendix C.

During the meetings on data quality objectives, process information and waste inventories were used to establish a two-phase closure strategy approach. Phase I will involve sampling the three T/S areas of the SHLWS T/S unit (storage, 90-day-or-less accumulation, and treatment) and the two areas in which actual spills occurred [SW spill and NE spill (see **Figure A.1 and Table A.1**)] for the contaminants of concern as identified in this plan. Figure A.1 identifies the 19 sampling locations, and Table A.1 describes the

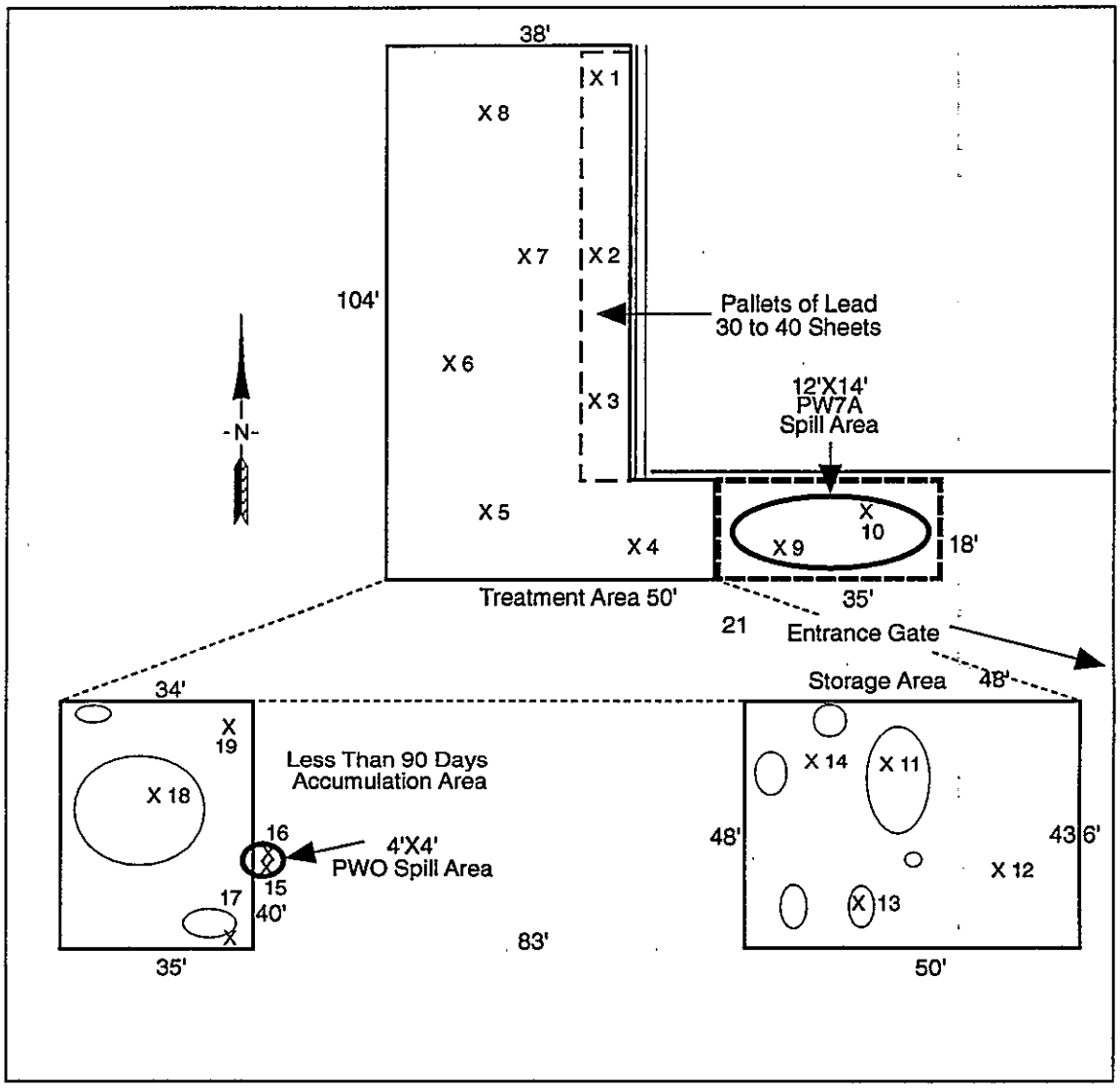

Figure A.1 Soil Sample Locations for SHLWS T/S Unit

Table A.1 Sampling Location Constituent List

Sample Number	Surface	Soil/Gravel Interface	18-in.
T/S Unit			
1	Pb		
2	Pb		
3	Pb		
4		ICP, Hg	ICP, Hg
5		ICP, Hg, Alpha, Beta	
6		ICP, Hg, Cerium	ICP, Hg
7		ICP, Hg	
8		ICP, Hg	
NE Spill			
9	Pb	ICP, Hg, Cerium	
10		ICP, Hg, Alpha, Beta	
Storage Area			
11	Pb	ICP, Hg, Cerium	ICP, Hg
12		ICP, Hg	
13	Pb	ICP, Hg	
14		ICP, Hg, Alpha, Beta	
SW Spill			
15	Pb	ICP, Hg, Cerium	
16		ICP, Hg, Alpha, Beta	
90-Day-or-Less Accumulation Area			
17		ICP, Hg	
18		ICP, Hg, VOA[a], SVOA[b]	ICP, Hg
19		ICP, Hg	ICP, Hg, VOA, SVOA

[a] VOA represents volatile organic compounds.
[b] SVOA represents semivolatile organic compounds.

depths from which samples will be taken and the analyses to be performed on samples from these locations. In addition to process information, a further investigation of historical records from before the start-up of the SHLWS T/S unit revealed that several pallets supporting lead materials (e.g., bricks, sheeting) had been maintained along the fence within what became the treatment area. These pallets were removed before the treatment process was begun and

were never considered to be part of the unit. This information was presented in the fourth (last) data quality objectives meeting, in which a sampling strategy was presented to Ecology and subsequently incorporated into this sampling and analysis plan.

If contamination is found at levels above the action levels of MTCA B (WAC 173-340-740), a Phase II closure strategy will be developed as an extension of the previous data quality objectives process. In this strategy the parameters for

- The extent of contamination
- Possible closure at MTCA C (WAC 173-340-740) levels, as shown in Table A.2
- Remedial activities if required
- Appropriate verification sampling following remediation
- Establishment of local background levels for soil, if required

will be identified and this plan will be amended accordingly.

Appendix B contains the quality assurance project plan to support the sampling and analysis activities.

A.4 SAMPLE RADIOLOGICAL ANALYSIS

As required by U.S. Department of Transportation (DOT) regulations (49 CFR 173) for shipping environmental samples, each sample collected at the SHLWS T/S unit will be analyzed for total activity. The 1234 Yard is not a radiological control area. No radiation work permit is required.

Table A.2. Potential Constituents, Analytical Methods, Detection Limits, and Action Levels

Analyte or Parameter (Measurement Method)	Analytical Method	Detection Limit[a,b] ppm	Action Levels: MTCA B Soil ppm	Action Levels: MTCA C Soil ppm	Sitewide Background[c] ppm
Aluminum	6010	45.0	8.0E+4	3.2E+5	1.51E+4
Antimony	6010	20.0	3.2E+4	1.4E+3	ND[d]
Barium	6010	2.0	5.6E+3	5.6E+3	1.75E+2
Cadmium	6010	1.0	4.0E+1	8.0E+1	ND
Calcium	6010	10.0	NA[e]	NA	2.46E+4
Chromium	6010	2.0	4.0E+2	8.0E+4	28
Cobalt	6010	2.0	4.8E+3	TBD[f]	19
Copper	6010	2.0	3.0E+3	1.4E+5	ND
Iron	6010	2.0	TBD	TBD	ND
Magnesium	6010	10.0	NA	NA	9.16E+3
Molybdenum	6020[g]	1.0	4.0E+2	1.75E+4	ND
Manganese	6010	1.0	1.12E+4	1.6E+4	5.83E+2
Nickel	6010	3.0	1.6E+3	1.6E+3	25
Potassium	6010	30.0	NA	NA	3.09E+3
Selenium	6020[g]	1.0	4.0E+2	1.75E+4	ND
Silver	6010	2.0	2.4E+2	1.75E+4	ND
Sodium	6010	30.0	NA	NA	1.38E+3
Strontium	6020[g]	1.0	4.8E+4	1.9E+5	ND
Lead	7421	0.4	2.5E+2	1.0E+3	14.9
Mercury	7471	0.4	2.4E+1	2.4E+1	1.3
Cerium	6020[g]	1.0	TBD	TBD	60 CA[h]
Semivol. org.	8270	[i]	TBD	TBD	ND
Volatile org.	8240	[i]	TBD	TBD	ND
Total activity	Screen		TBD	TBD	ND
Total alpha	Alpha		TBD	TBD	ND
Total beta	Beta		TBD	TBD	ND

[a] Soil digestion procedure, SW-3050.
[b] Accuracy and precision are discussed in Appendix B.
[c] DOE-RL 1993.
[d] ND = no data.
[e] NA = not applicable.
[f] TBD = to be determined; see Section A.5.9.
[g] Modified to PNL procedures.
[h] Crustal abundance; defined in AGI data sheet 58 (Dutro et al. 1989)
[i] Analyte dependent.

A.5 SOIL SAMPLING AND ANALYSIS

Soil samples will be collected and analyzed by either PNL or one of its supporting contract laboratories to assess whether dangerous waste constituents are present in surface and subsurface soils at the SHLWS T/S unit. If contaminants are present at levels that exceed proposed action levels, the data obtained will provide information for devising and implementing appropriate remedial action and for implementing an appropriate Phase II closure strategy.

A.5.1 Sampling and Data Quality Objectives

The primary objective of soil sampling is to determine whether dangerous waste contaminants are present in surface or subsurface soils at the SHLWS T/S unit at levels exceeding the proposed action levels, as shown in Table A.2. Potential contaminants of concern can be determined based on the waste inventory constituent list for the SHLWS T/S unit. Analytical methods must be sufficient to identify and quantify these constituents if they are present in the soil.

If dangerous waste constituents are present at or above proposed action levels, a second objective of the sampling will be to determine the extent and distribution of contamination.

Data quality objectives are developed to describe the overall level of uncertainty in environmental data that decision-makers are willing to accept. Typically, data quality requirements are specified in terms of objectives for precision, accuracy, representativeness, comparability, and completeness. Project-specific data quality objectives for soil sampling activities at the SHLWS T/S unit are identified in Appendix B.

A.5.2 Analytical Parameters

Parameters to be analyzed will be chosen based on the characteristics of waste managed at the SHLWS T/S unit. During operations, it was determined that some SHLWS waste (PW-0) met the toxicity characteristic of WAC 173-303-090(8). The Toxicity Characteristic Leaching Procedure (TCLP) extract for this waste exceeded the TCLP extremely hazardous waste concentration levels for barium (D005), cadmium (D006), chromium (D007), lead (D008) and silver (D011). However, it is not expected that these metals will be present in the soil at levels above those specified in MTCA-B. All of the SHLWS wastes (PW-0 and PW-7A) met the corrosivity characteristic (D002) as defined in WAC 173-303-090(6). Because pesticides are not known to have been stored at the SHLWS T/S unit, the pesticides and organics in the Toxicity Characteristic list of WAC 173-303-090(8) are not considered in establishing cleanup levels and parameters.

The SHLWS T/S storage area was not used to store wastes that are listed under WAC 173-303-081 or -082. The 90-day-or-less accumulation area may, however, have been used to store such listed wastes. Specifically, discarded chemical products wastes, as identified in WAC 173-303-081 and listed in WAC 173-303-9903 (U and P listed), or wastes from dangerous waste sources, as identified in WAC 173-303-082 and listed in WAC 173-303-9904 (F and K listed), may have been stored at the 90-day-or-less accumulation area. The organic constituents of these listed wastes should be at background levels. However, because the exact identities of constituents from previous storage activities are not known, soils will be analyzed for a broad range of volatile and semivolatile organics using gas chromatography/mass spectrometry (GC/MS). Soil samples will be analyzed for organic compounds identified in the U.S. Environmental Protection Agency's (EPA's) target compound list for Methods 8240 and 8270.

Table A.3 lists the contaminants of concern, the EPA-approved analytical method that will be used to determine the concentration of each contaminant of concern in the sample, and the numbers of baseline and quality assurance samples for the contaminant of concern.

A.5.3 Sampling Methodology

The following subsections discuss sample locations, background sampling, and analytical procedures that will be used to determine the concentrations of contaminants of concern at the unit.

A.5.3.1 Sample Locations

Soil samples will be taken from the 19 locations indicated in Figure A.1 and Table A.1. The minimum numbers and types of samples to be collected and submitted for analysis consist of the following:

90-day-or-less accumulation area:

- Three samples (from locations 17 through 19) will be collected at the soil and gravel interface, including one sample for volatile and semivolatile analysis.
- Two samples (from locations 18 and 19) will be collected at the 18-in. (45-cm) depth, including one (from location 18) for volatile and semivolatile analysis.

Storage area:

- Four samples (from locations 11 through 14) will be collected at the soil and gravel interface, including one cerium and one alpha/beta sample (both from location 11).
- Two samples (from locations 11 and 13) will be collected at the surface for lead analysis.
- One sample (from location 11) will be collected at the 18-in. (45-cm) depth.

Table A.3. Sample Analysis Methods and Samples to Be Taken for Each Contaminant of Concern

Constituent	Analytical Method	Analytical Laboratory	Number of Samples	Number for QC Analysis
Aluminum	6010	DataChem	21	2
Antimony	6010	Datachem	21	2
Barium	6010	DataChem	21	2
Cadmium	6010	DataChem	21	2
Calcium	6010	DataChem	21	2
Chromium	6010	DataChem	21	2
Cobalt	6010	DataChem	21	2
Copper	6010	Datachem	21	2
Iron	6010	DataChem	21	2
Magnesium	6010	DataChem	21	2
Molybdenum	6020[a]	PNL	21	0
Manganese	6010	DataChem	21	2
Nickel	6010	DataChem	21	2
Potassium	6010	DataChem	21	2
Selenium	6020[a]	PNL	21	0
Silver	6010	DataChem	21	2
Sodium	6010	DataChem	21	2
Strontium	6020[a]	PNL	21	0
Lead	7421	DataChem	7	1
Mercury	7471	DataChem	21	2
Cerium	6020[a]	PNL	4	0
Semivol. org.	8270	DataChem	2	1
Volatile org.	8240	DataChem	2	1
Total Activity	As per WHC		21	2
Total Alpha	Alpha	IT	4	1
Total Beta	Beta	IT	4	1

[a] Modified to PNL procedures.

Table A.4. Number and Depth of Samples

Analysis	Analytical Method	90-Day-or-Less Accumulation Area		Storage Area		Treatment and Storage Area		SW Spill Location Undisturbed	NE Spill Location Undisturbed	Total
		Soil and Gravel Interface	15-18 in.	Soil and Gravel Interface	15-18 in.	Soil and Gravel Interface	15-18 in.	Soil and Fill	Soil and Fill	
ICP Metals	6010[a]	3	2	4	1	5	2	2	2	21
Molybdenum, selenium, strontium	6020[a]	3	2	4	1	5	2	2	2	21
Lead	7421			2 (Surface)		3 (Surface)		1 (Surface)	1 (Surface)	7
Mercury	7471[a]	3	2	4	1	5	2	2	2	21
Cerium	6020[a]			1		1		1	1	4
Semivol.	8270	1	1							2
Vol. org.	8240	1	1							2
Total Activity	Screen	3	2	4	1	5	2	2	2	21
Tot. Alpha	Alpha			1		1		1	1	4
Total Beta	Beta			1		1		1	1	4
Total		14	10	21	4	26	8	12	12	107

T/S area:

- Five samples (from locations 4 through 8) will be collected at the soil and gravel interface, including one cerium sample (from location 6) and one alpha/beta sample (from location 5).

- Three samples (from locations 1 through 3) will be collected at the surface for lead analysis.

- Two samples (from locations 4 and 6) will be collected at the 18-in. (45-cm) depth.

SW Spill location:

- Two samples (from locations 15 and 16) will be collected at the undisturbed soil and fill level, including one cerium sample (from location 15) and one alpha/beta sample (from location 16).

- One sample (from location 15) will be collected at the surface for lead analysis.

NE Spill location:

- Two samples (from locations 9 and 10) will be collected at the undisturbed soil and fill level, including one cerium sample (from location 9) and one alpha/beta sample (from location 10).

- One sample (from location 9) will be collected at the surface for lead analysis.

Soil samples will be collected according to the provisions outlined in this section. Each soil sample will be a homogenized sample from one of the depths listed in **Table A.4**. If contamination at these locations exceeds MTCA Method B action levels, a Phase II closure strategy will be developed as described in Section A.3.

Primary sampling equipment to be used will include precleaned shovels, hand augers, trowels, buckets, coolers (with ice), precleaned and prelabeled sample containers, various screens or sieves, a hammer, and wooden stakes. All sampling equipment will be constructed of compatible non-reactive material.

All nondisposable sampling equipment that comes into contact with samples will be decontaminated between samples to prevent cross-contamination. Equipment will be decontaminated in the following manner:

1) Prior to release, equipment will be given a radiological survey by a radiation protection technologist (RPT) as required by PNL radiation protection procedures.

2) Equipment will be thoroughly scrubbed using Alconox or a similar laboratory detergent. All visible signs of contamination will be removed.

3) Equipment will be thoroughly rinsed with clean tap water, until it is certain that no detergent is left on the equipment.

4) Equipment will be given a final rinse with deionized water. Samples of rinse water will be collected periodically for equipment blanks to verify decontamination, as specified in Section 6.3.2.1 of the body of the report.

5) If equipment is not to be used immediately, it will be allowed to air-dry and will be wrapped with aluminum foil, with the dull side of the foil toward the equipment.

All decontamination wastes will be collected in polyethylene-lined drums or polyethylene carboys. Management of decontamination waste containers is described in Section 6.3.2.2. Prior to decontamination, all equipment will be radiologically surveyed. Decontamination waste from equipment that has been determined to be radioactively contaminated will be kept separate from non-radioactively contaminated waste.

Decontamination solution will be sampled as follows:

- The solution will be mixed by rotating the container
- The pH of the solution will be determined
- The solution will be poured into precleaned and prelabeled sample bottles
- Security tape will be affixed to seal the sample bottles
- Sample bottles will be placed in an ice chest on ice until total

activity results are received

- Samples will be delivered to the appropriate laboratory.

Large stones or cobbles will be removed from soil samples by sieving or screening. If sieving or screening is necessary, soil will be transferred directly to the sieve or screen and will be shaken into a collection bucket until enough material has been collected for the sample. The material will then be transferred directly into the sample container. Each sample container will then be sealed tightly, the sample label information completed, the lid of the sample sealed with security tape, and the sample placed into the ice chest.

Samples for total activity screening will be delivered to the laboratory at the conclusion of each workday. Once data for the total activity screening have been reviewed, the remaining samples will be transported on the following workday to the appropriate laboratory for the required analysis. Regardless of the laboratory to be used, all samples will be packed in suitable containers to ensure the required environmental conditions are met and will be shipped within the holding time allowable under the protocols for all analyses identified in this appendix.

A photograph will be taken of each sampling location showing the sample identification number. Wooden stakes will be used to mark the actual location in accordance with Figure A.1.

A.5.3.2 Background Samples

During Phase I, no local background samples are planned. If the analysis identifies contaminants at levels that exceed action levels, local background sampling may be implemented during Phase II activities.

A.5.4 Analytical Instrumentation and Procedures

PNL, PNL's contracting laboratories, and Westinghouse Hanford Company (WHC) analytical laboratories will follow procedures set forth by SW-846, as identified in Table A.2. Contracted laboratories for each analysis are identified in Table A.3.

A.5.5 Quality Assurance and Quality Control

The overall Quality Assurance Project Plan (QAPjP) in Appendix B sets forth the quality assurance requirements that apply for all sampling work being conducted. Sampling that will be performed as part of the quality assurance effort includes the following:

Duplicate Samples: Duplicate samples will be included for analysis with each batch of samples. In this context, a batch of samples refers to a group of samples collected during one sampling event by a single method. Duplicate samples will be placed in separate containers and assigned separate numbers or will be prepared in the laboratory by dividing (splitting) an individual sample (for laboratory quality control purposes). One sample in 10 will be duplicated.

Matrix Spike: Extra volume of sample is provided to the analytical laboratory for the performance of a matrix spike analysis. One extra volume is collected for every 10 samples.

Equipment Blank: Equipment that is used at more than one sample site is washed after each use to prevent cross-contamination. At the end of sampling, the equipment is washed, then rinsed with boiled Type II reagent water that is provided by the preparation laboratory. Sample bottles representing the analysis being done are filled with the rinse water to check the effectiveness of the washing.

A.5.6 Field Documentation

A field team leader will maintain a logbook during soil sampling activities. Information pertinent to ongoing activities at the closure areas

will be recorded in a legible manner with indelible ink in the logbook.

Samples will be accompanied by a Chain-of-Custody form in accordance with PNL sample chain-of-custody procedures (see **Figure A.2** and Appendix B).

A.5.7 Evaluation of Data

Data reliability will be evaluated through a review of field documentation, sample-handling procedures, analytical procedures, off-site laboratory documentation, and calibration records. The purpose of the review will be to establish the reliability of the data by verifying that

1) samples were labeled, handled, and controlled in a manner designed to minimize the possibility of physical misidentification,

2) instrumentation was maintained in calibration for the duration of the activity, and

3) analysis and calibration records are in complete and retrievable condition.

Procedures for quality control documentation will follow SW-846, Chapter 1, "Quality Assurance."

A.5.8 Statistical Evaluation

No statistical evaluations will be required during Phase I sampling

If any analyte from any sample indicates that contamination exceeds the action level, the entire unit will be placed under consideration in the Phase II sampling, remediation, and verification data quality objectives process, similar to that established for Phase I.

A.5.9 Determination of Proposed Action Levels

In accordance with the data quality objectives process, constituent

levels in soil will be compared against proposed action levels to assess the method of site closure. If a determination is made that some remedial action will be necessary as a condition of closure, a remedial action plan will be prepared. Soil cleanup action levels will initially be based on calculated MTCA-B acceptable exposure level information (WAC 173-340-740). These action levels are identified in Table A.2 and are in addition to MTCA-C levels and the levels reported from the Hanford sitewide background study (DOE-RL 1993). Those constituents that are of no concern are identified as NA (not applicable). For those constituents for which no background data are available, the levels are reported as ND (no data). For some constituents or groups of constituents that lack either background information or MTCA-acceptable limits, the qualifier TBD (to be determined) is shown. Under the agreements reached during the data quality objectives process, all analytical values associated with the TBD qualifiers will be carefully reviewed by PNL, DOE, and Ecology to determine whether any action may be required. Possible actions to be taken as a result of the review of TBD sampling data range from no action to additional sampling and/or soil removal, including appropriate verification sampling. If further action is required, the data quality objectives process will be repeated to obtain agreement on cleanup levels and follow-up sampling and remediation.

A.6 REMOVAL OF CONTAMINATED SOIL

A.6.1 Estimating the Volume of Contaminated Soil to Be Removed

In accordance with the data quality objectives process, soil constituent levels will be compared against proposed action levels, shown in Table A.2, to assess the method of site closure. If, as a result of the Phase II closure strategy, it is determined that some remedial action will be necessary as a condition of closure, a remedial action plan will be prepared. Action levels will initially be based on calculated MTCA-B acceptable exposure level

Surveyed : Yes ____ No ____? Less than 200 counts/minute: Yes ____ No ____? By (initials) ____

Battelle Pacific Northwest Laboratories Battelle Boulevard Richland, Washington 99352	CHAIN OF CUSTODY	Test User ID: C-of-C:

Company Contact: ____ Telephone: ____

Samples Collected by: ____ Date: ____ Time: ____

ID/Sample No.: ____

Ice Chest No.: ____ Field Logbook Page No.: ____

Remarks: ____

Possible Sample Hazard Identification: ____ Contract No.: ____

Destination: ____ Carrier/Waybill No.: ____

Ground-Water ____ Soil ____ Other ____

Shipping container internal temperature when samples sealed in it ____.

Shipping container internal temperature when opened in laboratory ____.

Sample Identification

Chain of Possession

Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
	Received by:	Date/Time:

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Figure A.2. Chain of Custody Form

information (WAC 173-340-740). If MTCA-B acceptable exposure levels cannot be met, then MTCA-C acceptable exposure levels will be evaluated, as listed in Table A.2. Levels defined by the Hanford sitewide background study (DOE-RL 1993) will also be used as guideline levels for evaluation of the data.

A.6.2 Soil Removal Survey Control

The process of soil removal survey control will be addressed under a similar data quality objectives process if it is necessary to initiate remediation action.

A.6.3 Soil Removal Operations

Any dangerous waste residues at the SHLWS T/S units are expected to be associated with surface soils contaminated by past leakage from PW-0 and PW-7A storage containers. Areas for remedial activities will be identified based on analytical results from Phase I sampling that show evidence of contamination. In the unlikely event that contaminated soil is present, this closure plan will be amended to address requirements to determine the extent of the contaminated area(s) and the specific steps needed for remediation. Based on observations of the areas, it is currently expected that any significant contamination will be limited to surface soils. If such contamination is found, PNL may elect to excavate shallow [3- to 9-in. (7.5- to 22.5-cm)] contaminated soils by hand or using a backhoe, depending on their extent, and transfer them to 55-gal (208-L) open-top drums. Drum-loading operations will be conducted over reinforced polyethylene tarps or drip pans to contain any soil that may be spilled and to prevent further soil contamination. After all drums are loaded, the tarps and any soil residuals on them will be put into drums. All drums will be sealed, labeled, and manifested according to the applicable DOT and dangerous waste requirements and transferred to a permitted TSD unit. The soils will be analyzed for total activity (gross alpha, beta,

and gamma) before excavation to ensure that the site activity falls within applicable DOT shipping requirements. In the unlikely event that total activity exceeds background levels, further isotopic analysis will be performed to verify whether the increased activity is representative of previously identified naturally occurring isotopes.

Following confirmation analysis at the site, excavated soil will be replaced with clean fill and the site graded to return it to its original state.

A.6.4 Verification Sampling

Removal of contaminated soil sufficient to meet the closure performance standard will be verified through the sampling and analysis program that will be developed under Phase II if such activities are required. Sampling and analysis will be conducted according to the QAPjP (Appendix B).

A.7 PERSONNEL TRAINING

All training records are kept in the unit compliance notebook maintained by the PNL unit manager.

A.8 SCHEDULE FOR CLOSURE

See Section 6 in the body of this report.

A.9 AMENDMENT OF SAMPLING AND ANALYSIS PLAN

If contamination is found to exceed action levels, the closure plan, including the sampling and analysis plan, will be amended to address the

decisions resulting from the Phase II closure strategy, new information, and required actions.

A.10 REFERENCES

49 CFR 100-177. "Transportation."

Dutro, J.T., Jr., R.V. Dietrich, and R.M. Foose. 1989. AGI Data Sheets, Crustal Abundances, Data Sheet 58, 3rd edition. American Geological Institute, Alexandria, Virginia.

EPA SW-846 Test Methods for Evaluating Solid Waste -- Physical/Chemical Methods

U.S. Department of Energy, Richland Operations Office (DOE-RL). 1993. Hanford Site Background, Part 1, Soil Background for Non-Radioactive Analysis, Rev. 1, volumes 1 and 2. U.S. Department of Energy, Richland, Washington.

WAC 173-303. "Dangerous Waste Regulations."

WAC 173-340. "Model Toxics Control Act."

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN (QAPjP)

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B.1 TITLE PAGE

QUALITY ASSURANCE PROJECT PLAN (QAPjP)

SIMULATED HIGH LEVEL WASTE SLURRY TREATMENT AND STORAGE (SHLWS T/S) UNIT CLOSURE

B.2 TABLE OF CONTENTS

B.2.1 Introduction

This document is the Quality Assurance Project Plan (QAPjP) for closure of the SHLWS T/S unit. Described in this plan are quality assurance procedures for field sampling activities associated with closure of the SHLWS T/S unit. These sampling activities are described in the Sampling and Analysis Plan (SAP, Appendix A of the Closure Plan) for the SHLWS T/S unit closure.

This QAPjP has been prepared in accordance with Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80 (Stanley and Verner 1983). The analytical laboratory performing the analysis of samples collected during closure activities will have a QAPjP in place to satisfy the requirements of this QAPjP and QAMS-005/80.

B.2.2 Contents

This plan contains the sixteen QAPjP components specified in the above guidance. The plan is organized as follows:

Section	Contents
B.1	Title Page
B.2	Table of Contents
B.3	Project Description
B.4	Project Organization and Responsibility
B.5	Quality Assurance (QA) Objectives for Measurement Data in Terms of Precision, Accuracy, Completeness, Representativeness, and Comparability
B.6	Sampling and Sample Preparation Procedures
B.7	Sample Custody, Preservation, and Storage

B.8 Calibration Procedures and Frequency
B.9 Analytical Procedures
B.10 Data Reduction, Validation, and Reporting
B.11 Internal Quality Control Checks
B.12 Performance and System Audits
B.13 Preventive Maintenance
B.14 Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness
B.15 Corrective Action
B.16 Quality Assurance Reports to Management

B.2.3 Distribution

PNL

DE Knowlton
KR Martin
HW Slater
HT Tilden II

B.3 PROJECT DESCRIPTION

Pacific Northwest Laboratory (PNL) is responsible for day-to-day activities at the SHLWS T/S unit. This unit is located in the 3000 Area adjacent to DOE's Hanford Site. The unit was used for the storage and treatment of simulated high-level waste slurry (a dangerous waste) and for the accumulation of containers of dangerous waste. The unit has been operated under interim status as a storage and treatment unit and will undergo closure under interim status. Closure activities are described in the body of the Closure Plan.

The SHLWS T/S unit is being closed according to the requirements of WAC 173-303-610 and 40 CFR 265 Subpart G. These requirements call for the removal

of all dangerous wastes and dangerous waste residuals at the time of closure. To verify that all dangerous wastes and residuals have been removed, sampling and analysis will be required. Specific sampling objectives related to regulatory requirements are described in the SAP (Appendix A).

Soil samples will be taken, as described in the SAP (Appendix A), to determine that all soil contaminated by operation of the unit has been removed. The soil underlying areas used for dangerous waste storage and treatment and dangerous waste accumulation will be sampled to verify that any contaminants present are below regulatory limits. Using grids, samples will be taken at randomly selected locations within waste management areas (locations are shown in Appendix A, Table A.2). Soils that have been contaminated by past spills or leaks above action levels defined in the SAP (Appendix A) may be removed for disposal. Sampling and analysis will be required to determine the regulatory status of these soils and to ensure proper disposal.

Some of the waste management equipment at the SHLWS T/S unit will be decontaminated. Liquid decontamination solutions will be used to decontaminate this equipment. The liquid wastes resulting from decontamination will be sampled to determine whether they are dangerous wastes.

Samples will be collected by PNL staff using procedures described in the SAP (Appendix A). As samples are collected, they will immediately be identified with a unique sample number and the chain of custody will be initiated. Samples will be transported to the analytical laboratory at the conclusion of each day's sampling activities for sample preparation and analysis.

B.4 PROJECT ORGANIZATION AND RESPONSIBILITY

Sampling activities associated with closure will be performed under the direction of PNL. A PNL quality engineer will serve as Quality Assurance Representative and will be responsible for monitoring activities to ensure that the requirements of this QAPjP and the analytical laboratory's QAPjP are being adhered to. Appropriate PNL staff will be selected to oversee and conduct the field activities. Field activities will be under the supervision of the field team leader. One of several possible analytical laboratories will be selected, depending on availability at the time of sampling. Thus, analyses may be conducted by PNL analytical laboratories, the Hanford Environmental Health Foundation, or a subcontract laboratory. The laboratory performing the analyses will have in place a QAPjP that meets the requirements of this QAPjP and QAMS-005/80. The laboratory QAPjP will be approved by PNL prior to submission of samples.

B.5 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Data quality objectives (DQOs) are based on the specific objectives of the project. DQOs are selected so that the data collected during the project are of adequate quality to ensure that project objectives are met. Additional considerations for DQOs are proven performance of analytical methods and procedures and indirect requirements, such as regulatory mandates. Analytical laboratory contracts with PNL include specific instructions for precision and accuracy, as noted in subcontracts with DataChem Laboratories (DCL 121121-A-M1) and IT Analytical Services (IT 163635-A-M1).

This project involves collection and analysis of samples to determine whether closure performance standards have been met at the SHLWS T/S unit and to determine the regulatory status of wastes generated during closure

activities. Specific data (e.g., analyses and detection limits) needed to satisfy regulatory requirements are identified in the SAP (Appendix A).

Specific QA objectives for this project are as follows:

1. Establish sampling techniques in such a manner that the analytical data are representative of the soils and wastes being sampled.

2. Collect and analyze a sufficient number of duplicate field samples to establish sampling precision. Field duplicates will be used to establish precision among replicate samples collected from the same sample location. Laboratory duplicates of the same sample will provide a measure of precision within that sample (i.e., sample homogeneity).

3. Analyze a sufficient number of analytical duplicate samples (as specified in the analytical method) to assess the performance of the analytical laboratory.

4. Collect and analyze a sufficient number of equipment blank samples to evaluate the potential for contamination from sampling equipment and techniques and/or transportation.

5. Analyze a sufficient number of blank, standard, duplicate, spike, and check samples in the laboratory (as specified in the analytical method) to evaluate results against numerical QA goals for accuracy and precision.

Laboratory QA procedures to ensure that analytical data meet DQOs are discussed in detail in the laboratory QAPjP. The following sections discuss activities to be performed during field sampling to support QA objectives.

B.5.1 Accuracy

Accuracy refers to the difference between the reported test results and the true value of the parameter being measured. Accuracy of chemical analyses will be evaluated in the laboratory using such techniques as Percent Recovery for evaluation of spikes or known additions to sample matrices, and Percent

Relative Error for evaluation of analysis of standards or other reagents of known concentration.

B.5.2 Precision

Precision refers to the reproducibility of measurements under a given set of conditions and is generally expressed as the variability of a set of measurements against their average value. Precision of chemical analyses will be assessed through analysis of duplicate aliquots of samples and evaluated using such techniques as Relative Standard Deviation as specified in subcontracts DCL-121121-A-M1 and IT-163635-A-M1. The field activity related to determining precision of analytical results is collection of blind duplicate samples for analysis by the laboratory.

Precision in analyses will be assessed through analysis of duplicate aliquots of samples. When dealing with solid wastes and soils or other geologic materials, the precision attainable in the laboratory is a function of the relative homogeneity of the sample material. As the sample material becomes more homogeneous, the ability to select similar aliquots of sample increases, and the relative precision of the duplicate analyses improves (i.e., the range of analytical values decreases). Any factors that could affect the precision of duplicate analyses should be noted in the laboratory report. These factors might include obvious stratification of material, degree of sorting of particle sizes, the presence of multiphase materials, color variations in the sample material, and any other factor that indicates the degree of heterogeneity of the sample.

B.5.3 Representativeness

Representativeness refers to how closely the results measured in the laboratory reflect the actual conditions in the medium sampled. The objective

of representativeness is addressed through the use of appropriate sampling methods and sample handling procedures. Sampling rationale and methods are described in the SAP (Appendix A).

Representativeness is also evaluated through the use of equipment blanks and travel blanks. These samples will be analyzed to determine whether contamination is introduced to the samples through handling in the field.

B.5.4 Completeness

Completeness refers to the percentage of measurements planned that are judged to be valid measurements. The initial objective for completeness of samples is 95%. This objective means that at least 95% of the samples taken in the field will be received by the laboratory in good condition and acceptable for analysis. Corrective measures are addressed in the subcontracts for DataChem Laboratories (DCL 121121-A-M1) and IT Analytical Services (IT 163635-A-M1).

The initial objective for completeness of chemical analyses in the laboratory is 90%. This objective means that usable analytical data will be produced for a minimum of 90% of the analyses requested on all samples submitted to the laboratory. This objective will be reviewed after actual performance data are available for each sample type analyzed. The objective may be revised upward or downward based on actual performance, but it will not be revised downward without making and documenting a reasonable effort to identify and rectify the limiting factor(s). Based on actual laboratory performance in analysis of samples, individual completeness objectives for individual analytical methods may be developed.

If there is loss of analytical data, a corrective action will be initiated to identify the cause of the loss and prevent its recurrence.

B.5.5 Comparability

Comparability refers to the ability to compare the results of various measurements. The objective for comparability is to obtain measurements that are directly comparable. This objective will be met through the use of methods specified by the EPA in SW-846 (Test Methods for Evaluating Solid Waste -- Physical/Chemical Methods) and by the State of Washington in WDOE 83-13 (Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulation).

B.6 SAMPLING AND SAMPLE PREPARATION PROCEDURES

Samples will be collected and preserved to help ensure that QA objectives are met. The following sections discuss sampling procedures, sample containers, and sample preservation and holding time.

B.6.1 Sampling Procedures

Sampling procedures for soils and wastes are presented in the SAP (Appendix A). These procedures are designed so that samples are collected in a manner that will ensure that project objectives are met.

Quality assurance objectives for sample collection will be met through use of duplicate samples, chain-of-custody, and laboratory QA procedures. These items are discussed below.

Duplicate samples will be used to establish precision of the data. The number of field duplicates submitted will be 10% of the total of each sample parameter and/or one duplicate for each sample parameter per day, whichever is greater. Duplicate samples will be obtained by collecting a single sample, mixing it thoroughly, and splitting it into two identical sample containers.

Equipment blanks will be used to determine whether contamination is introduced during sampling procedures. A sample of the last water rinse from tool decontamination will be collected and analyzed to confirm the absence of sample cross-contamination. One equipment blank will be collected for each 10 decontamination cycles, but not less than once per day.

Laboratory QA procedures are described in the laboratory QAPjP. These procedures include the use of method blanks, spiked samples, duplicate samples, check standard samples, and the chain-of-custody procedures described in Section B.7.

B.6.2 Sample Containers

Sample containers to be used for soil and waste samples are described in the SAP (Appendix A). Precleaned analytical containers that are certified clean by the manufacturer will be used.

B.6.3 Sample Preservation and Holding Time

Preservation methods and holding times for the samples to be collected during SHLWS T/S unit closure are as follows:

Soils

Metals - Preserve by cooling to 4°C; holding time 6 months

Volatile Organics - Preserve by cooling to 4°C; holding time 14 days

Semivolatile Organics - Preserve by cooling to 4°C; holding time 7 days until extraction

Liquid Wastes

Metals - Preserve by acidifying with nitric acid to pH<2 and cooling to 4°C; holding time 6 months

Solid Wastes

Metals - Preserve by cooling to 4°C; holding time 6 months

Toxicity Characteristic Leaching Procedure (TCLP) Toxicity - Preserve by cooling to 4°C; holding time 6 months.

Samples will be delivered or shipped to the laboratory daily to ensure that holding time limits are not exceeded.

B.7 SAMPLE CUSTODY, PRESERVATION, AND STORAGE

Samples will be handled, preserved, and stored using procedures that ensure that quality objectives are met. The following sections describe field activities related to sample chain of custody, documentation, and corrections to documentation.

B.7.1 Field Chain-of-Custody Procedures

Sample chain of custody refers to the process of tracking the possession of a sample from the time it is collected in the field until laboratory analysis is completed. For a sample to be considered to be under a person's custody, one of the following requirements must be met:

- The sample must be in the physical possession of the person.
- The sample must be in view of the person after he or she has taken possession.
- The sample must be secured with tamper-indicating seals by the person in possession immediately on collection.
- The sample must be secured by the person in an area that is restricted to authorized personnel. In all cases involving the use of a PNL laboratory or other analytical laboratory on the Hanford Site, samples will be maintained in restricted access areas and in the possession of field or analytical staff.

Sample possession will be recorded on a chain-of-custody form. The form to be used is shown in Figure B.1. This form also provides a record of the analyses requested for each sample. Each time possession of the sample or sample container is transferred between individuals, both the sender and receiver sign and date the chain-of-custody form. Similar information will be recorded on the analytical request forms to be provided by the laboratory.

B.7.2 Field Sampling Operations

Field sampling operations important to QA include documentation of field activities and documentation of sample information (i.e., sample location). All field activities will be documented in the field notebook or in a geologist's log by the field team leader. This documentation will include the following:

- personnel present during field operations
- procedures used for sampling [including any deviations from the SAP (Appendix A) and reasons for deviations]
- time of sample collection
- description of sample locations
- number and types of sample containers filled at each sample location
- conditions or other observations during sampling (e.g., weather), especially conditions that could impact analytical results.

Each page of the field notebook or geologist's log will be dated and signed by the field team leader.

Documentation of sample location is very important. The location of each soil sample will be established according to grids, which are discussed in the

Surveyed : Yes ____ No ____? Less than 200 counts/minute: Yes ____ No ____? By (initials) ____

Battelle Pacific Northwest Laboratories Battelle Boulevard Richland, Washington 99352	CHAIN OF CUSTODY	Test User ID: C-of-C:

Company Contact: _____ Telephone: _____

Samples Collected by: _____ Date: _____ Time: _____

ID/Sample No.: _____

Ice Chest No.: _____ Field Logbook Page No.: _____

Remarks: _____

Possible Sample Hazard Identification: _____ Contract No.: _____

Destination: _____ Carrier/Waybill No.: _____

Ground-Water _____ Soil _____ Other _____

Shipping container internal temperature when samples sealed in it _____.

Shipping container internal temperature when opened in laboratory _____.

Sample Identification

Chain of Possession

Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
	Received by:	Date/Time:

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Figure B.1. Chain-of-Custody Form

SAP (Appendix A). This information will be recorded in the field notebook or geologist's log. Wooden stakes marked with the sample number will be driven into the ground at each sample location. A photograph will be taken of each sample location and will include the sample identification number.

Each sample will be assigned a unique sample identification number, as described in the SAP (Appendix A). These numbers will be assigned in advance of the field effort and will be used to prepare sample labels for each container to be used. The sample label will contain the following information:

- sample identification number (entered in advance)
- date and time of sample collection (entered in field)
- sample type (e.g., grab or composite) and sample medium (entered in advance)
- required analysis and preservatives (entered in advance)
- initials of sampler (entered in field).

Labels will be attached to each container before entering the field. Field information will be entered on the labels using waterproof ink. After the label is completed, it will be wrapped with waterproof, transparent tape.

B.7.3 Corrections to Documentation

All original data recorded in field notes, chain-of-custody records, and other forms are written with permanent, waterproof ink; no erasures of data will be made. If an error is made on a document, the individual making the entry will correct the document by crossing a line through the error, entering the correct information, and dating and initialing the correction. Any error discovered on a document subsequently will be corrected in the same manner (i.e., crossed through, initialed, and dated).

B.8 CALIBRATION PROCEDURES AND FREQUENCY

All instruments and equipment used during sampling will be operated, calibrated, and maintained according to manufacturer's guidelines and recommendations. Operation, calibration, and maintenance will be performed by personnel who have been properly trained in these procedures.

The only direct measurements expected to be taken in the field are distance measurements for sample location and pH of liquid wastes. Distance measurements necessary to establish the sample grid will be made with a steel tape. Temperature measurements will be made with a mercury or electronic thermometer, which will be calibrated before sampling begins. The pH measurements will be made with a portable pH meter. This meter will be calibrated with standard buffer solutions prior to each measurement.

Procedures and schedules for calibration of laboratory instruments are contained in the laboratory QAPjP.

B.9 ANALYTICAL PROCEDURES

The only field analytical procedure that might be conducted is field measurement of the pH of aqueous wastes. These measurements, if required, will be conducted using the procedure in Attachment 1 to Appendix B of Chemical Testing Methods for Complying With the State of Washington Dangerous Waste Regulations, WDOE 83-13.

Laboratory analytical methods are identified in the SAP (Appendix A).

B.10 DATA REDUCTION, VALIDATION, AND REPORTING

All analytical data used in calculations will first be reviewed by the cognizant analytical supervisor. Procedures for validation of data are included in the laboratory QAPjP. The laboratory will submit backup data in the data package, as requested, for use in verifying data validation. These backup data will be used to confirm that the data quality objectives have been met. The results of this validation will be documented in a QA/QC report for each analytical data package received from the laboratory. This report will be maintained in the project files. In addition, a PNL representative will review the data under established guidelines for RCRA closure. Any anomalies that significantly impact the quality of data will be reported to the PNL project manager, who will disseminate the information to the appropriate parties (e.g., DOE, Ecology).

All calculations will be performed on standard calculation sheets that will include the date and the name of the person performing the calculations. All calculations will be checked by a second person. This second person's name and the date that the calculations were checked will also be entered on each calculation sheet. All calculation sheets will be retained in the project file.

Following PNL's internal data review process, all analytical results will be reported during a meeting with all stakeholders (PNL, DOE, and Ecology) to determine whether the requirements for closure have been satisfied. If these requirements have not been satisfied, a Phase II DQO process will be initiated, as discussed in the sampling and analysis plan (Appendix A).

B.11 INTERNAL QUALITY CONTROL CHECKS

Quality control of data will involve the collection of field sample duplicates and blanks (described in Section B.5), laboratory analysis of the samples, and evaluation of the data. The following internal quality control checks that will be implemented to ensure that all data generated are of a known quality:

- Field Activities
  - At least one duplicate sample of each sample parameter will be collected each day.
  - The total number of duplicates collected for each sample parameter will be 10% of the total number of samples collected, or a minimum of two.
  - One container blank will be submitted for each lot of sample containers used.
- Laboratory Activities
  - A multipoint calibration curve will be generated for each parameter to be measured. As appropriate for each parameter, a new calibration curve will be generated daily or with each batch of samples analyzed, or a midrange calibration-curve check sample will be analyzed daily with each batch of samples analyzed.
  - One method blank will be analyzed daily for each method at a 5% frequency or one per batch of samples, whichever is more frequent.
  - At least one sample will be analyzed in duplicate with each batch of 20 or fewer samples.
  - At least one spiked sample will be analyzed with each batch of 20 or fewer samples.
  - An EPA QC-certified sample will be analyzed.
  - Surrogate spikes will be added to and analyzed with each volatile organics and semivolatile organics sample analyzed.

B.12 PERFORMANCE AND SYSTEM AUDITS

No audits are scheduled for this activity. However, a surveillance of sampling activities will be performed by PNL's Quality Assurance Representative. The requirement for systems audits for the field activities associated with closure of the SHLWS T/S unit will be satisfied by approval of this QAPjP and the SAP (Appendix A) by the PNL Quality Assurance Representative. This QAPjP, the SAP (Appendix A), and all procedures referenced therein must be approved prior to conducting any field activities. Corrective actions will be addressed as described in Section B.15 of this QAPjP.

B.13 PREVENTIVE MAINTENANCE

Field activities do not require the use of equipment other than field analytical instruments (e.g., pH meter) and common hand tools. All equipment to be used in the field will be maintained according to the manufacturers' recommendations. Because of the limited amount and simplicity of the field equipment, failure of any field instrumentation or equipment would not significantly impact data quality or project schedule. Additional instrumentation or equipment can be readily obtained within an hour should failure occur.

The preventive maintenance program for laboratory equipment is described in the laboratory QAPjP.

B.14 ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

Procedures to assess precision, accuracy, and completeness of laboratory data are described in the analytical subcontracts DCL 121121-A-M1 and IT 163635-A-M1.

B.15 CORRECTIVE ACTION

Events or conditions that produce, or may produce, adverse effects on quality of data will be addressed through documented corrective action, as per PNL's quality assurance manuals.

B.16 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Quality Assurance Representative will prepare periodic reports summarizing the QA/QC status of the project and any adverse events or conditions. These reports will be submitted to the Project Manager and cognizant PNL management. Items that may be addressed in these reports include

- results of performance or system audits
- significant QA problems and recommended solutions
- corrective actions taken for any problems previously identified.

Such reports will be prepared after each system audit and following discovery of any event or condition requiring corrective action.

The field team leader will prepare a report to the project manager and cognizant PNL management at the conclusion of sampling activities and on discovery of any adverse event or off-normal condition. Items that may be addressed include

- status of field activities
- significant QA problems and recommended solutions
- corrective actions taken for any problems previously identified.

The responsible analytical supervisor will prepare a report to the project manager and cognizant PNL management at the conclusion of analytical activities or on the discovery of any adverse event or off-normal condition, as required by subcontracts DCL 121121-A-M1 and IT 163635-A-M1.

B.17 REFERENCES

40 CFR 265. "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

EPA SW-846 Test Methods for Evaluating Solid Waste -- Physical/Chemical Methods

Stanley, T. W., and S. S. Verner. 1983. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. OER-QAMS-005/8, EPA-600/4-83-004, U.S. Environmental Protection Agency, Washington, D.C.

WAC 173-303. "Dangerous Waste Regulations."

WAC 173-340. "Model Toxics Control Act."

WDOE 83-13 Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulation

APPENDIX C
MINUTES OF THE DATA QUALITY OBJECTIVES MEETINGS

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C.1 TITLE PAGE

MINUTES OF DATA QUALITY OBJECTIVES MEETINGS

C.2 TABLE OF CONTENTS

C.3 Introduction

This appendix contains minutes for the four meetings at which data quality objectives (DQO) for the SHLWS T/S Closure Plan were defined. Lists of attendees, notes taken during the meeting, and any associated materials for each meeting are included as Attachments 1 through 4.

C.4 Meeting Minutes for the Simulated High-Level Waste Slurry T/S Unit Closure Plan Data Quality Objectives, February 2, 1994

A list of those attending the first DQO session is attached (Attachment 1).

A copy of the meeting rough notes as developed during the course of the DQO meeting is also attached (Attachment 1). The first meeting was devoted to developing an understanding of the issues that will impact closure, a list of information requirements to support DQO activities, and a list of the decisions required to establish the approach to sampling and analysis. The

attached meeting notes (Attachment 1) summarize the issues, information requirements, and key decisions to be made.

Specific conclusions[1] arrived at in the meeting include the following:

- Since the SHLWS T/S unit is enclosed within an industrial material laydown yard that is expected to be used as a laydown yard for years to come, closure will involve returning the area impacted by the SHLWS T/S unit to the laydown yard background.

- The SHLWS T/S unit is located within a laydown yard that would be zoned as Light Industrial, should the City of Richland take over that area. Recent public announcements have included the area occupied by the unit (among others) as part of a Research Park. It does not appear that closure to Model Toxics Control Act (MTCA; WAC 173-340) residential standards would be consistent with the future planned use of the area occupied by the unit.

- The 90-day-or-less accumulation area was set up in mid-1987 and used to approximately August 1988. Pacific Northwest Laboratory (PNL) has identified additional information that more completely defines the hazardous material that was managed in the 90-day-or-less accumulation area.

- PNL will do the sampling at the site and arrange the analysis through their existing contracts with DataChem Laboratories and IT Analytical Services. Turn around of samples can range from 48 hours to 35 business days, depending on how much we are willing to pay.

- PNL would like to begin sampling by June and complete closure within the 180 days allowed by the Washington Administrative Code after approval of the Closure Plan.

- The physical boundaries of the area impacted by the unit were described. The area of impact was limited to the 90-day-or-less accumulation area, the two sections where treatment and storage of the SHLWS occurred, and areas between all three.

[1]A number of conclusions are necessarily tentative until they have been reviewed from the perspective of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

- A discussion of the operational history of the unit as it related to sources of potential environmental contamination were discussed. Two spills were identified. (The source and characteristics of the leakage from the drums were not discussed. H. W. Slater should discuss this at the next DQO workshop.)

Actions assigned at the meeting:

- H. W. Slater will provide data on the materials managed at the 90-day-or-less accumulation area.

- Ecology [Resource Conservation and Recovery Act (RCRA) and CERCLA] will identify which contaminants of concern they are interested in and vertical sampling requirements.

- PNL and Ecology will consider options for defining how cleanup decisions are made based on sampling data.

- DOE will evaluate how the CERCLA 1100-EM-3 operable unit work plan addresses the closure of the 1234 yard and/or the SHLWS T/S unit will also be discussed.

Status of action items will be covered at the next meeting, scheduled for February 7, 2:00 p.m., Mt. Rainier Conference Room, 337 Building. Topics to be covered in the next meeting include finalization of decisions that must be made and identification of constraints affecting the decisions, analytes and additional data to support closure, levels of uncertainty in measurements, and preliminary decision logic for closure.

C.5 Meeting Minutes for the Simulated High-Level Waste Slurry T/S Unit Closure Plan Data Quality Objectives, February 7, 1994

Next Meeting: February 24, 2:00 p.m., Suite Conference Room, 324 Bldg.

A list of those attending the meeting and a copy of the meeting rough notes, as developed during the course of the DQO meeting, are attached (Attachment 2). The second meeting was devoted to addressing the action items from the first meeting, discussing sampling requirements, and developing a

decision tree related to developing sampling criteria. H. W. Slater previously provided Ecology and meeting participants a complete list of material also included within the 90-day-or-less accumulation area. Other inputs provided at the meeting include the following:

- Alex Stone of Ecology indicated that, in addition to the appropriate heavy metals found in the original feed material, our analysis should include nitrites, nitrates, volatile organics, and semivolatile organics. The organic sampling will apply to the 90-day-or-less accumulation area only.

  He tentatively suggested the following sampling strategy:

  - 90-Day-or-Less Accumulation Area--Five samples, three at the soil and gravel interface, and two at least 45 cm (18 inches) but as much as 1 m (3 feet) deep as possible with a hand auger.

  - Storage/Treatment Area--Twelve samples, nine at the soil-gravel interface, and three at 45 cm (18 inches) or deeper.

  - Background--A preliminary sample size of four samples was suggested; however, Bob O'Brien, Evan Dresel, and Clark Lindenmeier will meet and develop the recommended background determination bases. **(ACTION)** More or fewer samples may result from this effort. The recommendation is still to clean up to the background of the 1234 Yard and/or MTCA, whichever is greater, and not to the Hanford Site background levels.

- Ken Redus developed a decision tree regarding the sampling process (attached).

- Wayne Slater informed Ecology and meeting participants that some past soil sampling records for the storage areas (early 1987 time period) have been found and are available for reference.

The attached meeting notes summarize the meeting decisions, and conclusions (Attachment 2). Other **ACTIONS** identified include the following:

- Alex Stone will check on use of field screening.

- Clark Lindenmeier will examine the applicability of field screening to sampling needs.

- Alex Stone will check on and evaluate the appropriateness of using the new Ecology computer model in the development of this sampling and analysis plan.

C.6 Meeting Minutes for the Simulated High-Level Waste Slurry T/S Unit Closure Plan Data Quality Objectives, February 24, 1994

Next Meeting: March 10, 2:00 p.m., Suite Conference Room, 324 Bldg.

A list of those attending the meeting and a copy of the meeting rough notes, as developed during the course of the DQO meeting, are attached (Attachment 3). The third meeting was devoted to addressing the action items from the first meeting, discussing sampling requirements and cleanup levels/standards, and developing a list of contaminants of concern.

SOME KEY RESULTS OF THE MEETING

- Field Screening: It is OK to use as a secondary tool to determine the extent of contamination and initial remediation once a hot spot has been identified. Field screening is not to be used to identify hot spots or to confirm that contamination has been removed. **(ACTION)** Evan Dresel will confirm availability and capability of PNL equipment to do volatile organic/semivolatile organic field screening.

- Analytes of Concern: A list of analytes of concerned and the analysis method recommended for each analyte was developed. Ecology will determine if there is a need to analyze for lanthanum, neodymium and cerium. **(ACTION)** Alex Stone will resolve by 3/4/94.

- Alex Stone indicated that use of the new Ecology computer model in the development of the sampling and analysis plan for this unit was not appropriate.

- The final decision for establishing the requirements for analyzing samples for radioactive contamination material was deferred until the next meeting. PNL will do field screening (total count) for radioactive contamination (all samples) before shipping samples off-site in accordance with U.S. Department of Energy (DOE) and PNL requirements. Ecology indicated that this was not adequate. The DOE Richland Operations Office (DOE-RL) and PNL indicated that the requirement for

and use of formal radiological analysis of samples is a DOE/Ecology jurisdictional issue. Ecology indicated that MTCA specifies cleanup levels for radioactive material and that a gross alpha/beta analysis of each sample was required. Randy Krekel (DOE-RL) indicated that while gross alpha/beta analysis may be performed, the applicability of using such information for cleanup purposes may be challenged by DOE. **(ACTION)** Randy will determine if a consensus was reached concerning this issue during the Tri-Party Agreement process.

- Sampling for volatile/semivolatile organic analysis in the 90-day-or-less accumulation area is required. Sampling methods 8270 and 8240 should be used. Analysis specifically for ethylene glycol and isopropyl alcohol is not necessary. **(ACTION)** Alex Stone will check to see if Method 8260 can be substituted for Method 8240.

- Background organic sampling is not required unless it is determined by sampling/remediation within the 90-day-or-less accumulation area that there may be an organic contamination problem in the entire 1234 Yard.

- When determining if cleanup may be required, the absolute sampling results will be compared to the MTCA standard. Where sampling data are above the MTCA standard, then remediation needs to be addressed.

- It was recommended that PNL be prepared to discuss specific sampling and data review/validation strategies at the next DQO meeting. **(ACTION)** Clark Lindenmeier and Bob O'Brien/Evan Dresel will prepare as required.

Additional information and conclusions related to the meeting discussions is provided in the attached meeting notes (Attachment 3).

C.7 Meeting Minutes for the Simulated High-Level Waste Slurry T/S Unit Closure Plan Data Quality Objectives, March 14, 1994

A list of those attending the DQO meeting is attached (Attachment 4). The fourth meeting was devoted to addressing the action items from the third meeting, finalizing sampling requirements and cleanup levels/standards, and developing the validation/verification criteria.

SOME KEY RESULTS OF THE MEETING

- Glenn Thornton, the former unit operations supervisor and PNL contractor representative for the unit, defined the movement of material between the storage, treatment, and 90-day-or-less accumulation area. Movement out of the 90-day-or-less accumulation area was from the north end in all cases.

- Clark Lindenmeier noted that, according to Glenn Thornton, lead material had been stored along the east fence of the treatment area prior to its becoming part of the interim status facility. Two to three surface samples will be taken in this area to determine if there is any lead surface contamination. He also displayed a layout of the T/S area, indicating the location of two spills. According to Glenn, these were the only two spill events during the operation of the SHLWS unit. The spills were immediately cleaned up by removing all wet soil down to a depth of approximately 15 to 20 cm (6 to 8 inches). The contaminated soil was subsequently grouted during the SHLWS treatment operation. The spill areas will be sampled, as will other areas where there is some indication of discoloration on the surface soils. All sampling within the areas of known spills will be conducted below the disturbed area in the 25- to 45-cm (10- to 18-inch) range (as practicable). All additional sampling (e.g., areas of discoloration, traffic areas) will be conducted just below the surface gravel layer [approximately 15 cm (6 inches)]. A total of 21 primary samples (not including duplicates or other quality control samples) will be collected in the areas identified as known spills or where soil discoloration occurs, the 90-day-or-less accumulation area, the satellite storage area, the treatment area, and adjacent traffic areas. No "local background" sampling will be conducted during Phase I sampling.

- It was decided that cerium would be analyzed as an indicator for the lanthanide metals if it was determined that a cleanup standard for this material existed. Alex Stone will check with Ecology's Lacey office (by March 22) to determine if there is any basis for cleanup standards for cerium. Clark Lindenmeier will look into what analytical procedures are available at PNL to analyze for cerium if required, since the standard outside contract laboratory available to PNL for sample analysis does not include the lanthanides in their analysis.

  Clark and Alex will try to resolve this issue informally. Further discussion of this issue would be covered in the April 14, 1994, Unit Manager's meeting (UMM) if it cannot be resolved directly between Ecology, PNL, and DOE prior to that time.

- MTCA-B is still the cleanup standard goal. If Hanford background cleanup standards are greater than MTCA-B, then cleanup to Hanford background will be considered (if acceptable to Ecology at the time of cleanup) and if necessary. Cleanup to MTCA-C is also an option that may be considered if required.

- The issue as to whether Ecology has jurisdiction over the cleanup of radionuclides remains unresolved. Alex Stone of Ecology presented some information (Attachment 4) concerning regulatory authorities within MTCA to regulate radioactive species. This information has been forwarded to Ecology Headquarters (by Ecology, Kennewick) to determine if this policy will be applied to the Hanford Site. (Ecology Headquarters has yet to determine policy on this matter.) While DOE-RL and PNL do not agree that Ecology has jurisdiction over radioactive contamination, DOE-RL and PNL decided that, for informational purposes only, two samples will be radiologically screened for alpha/beta contamination. If hits are experienced on the sample screening, additional gross alpha/beta analysis will be performed for those samples. The resolution on what should be done with the information (whether it should be used in determining clean closure), should there be an indication of radioactive contamination, will be left for a decision at a later date.

- The use of field screening methods for semivolatiles and heavy metals may be addressed in the Closure Plan, if there is a need for more than minor remediation at the sites and feasible technologies are identified. The use of field screening for organics is acceptable only if a gas chromatograph/mass spectrometer (GC/MS) can be brought to and used on site.

- Clark Lindenmeier and Janet Julya presented a summary of the quality control requirements for samples (Attachment 4). The changes agreed to include increasing the duplicates for metals to two. There will be one duplicate for organics. Phase I sampling is expected to be done in a single day. If multiple sampling days are involved, provisions in the plan will be made for additional QA samples.

- Joan Bartz pointed out that full trip blanks have not been required for other sites at Hanford. Alex Stone will look into the need for these. These will not be included unless Alex instructs PNL otherwise. If further discussion is necessary on the issue, it will also be addressed in the UMM forum.

- Ken Redus of MACTEC, and the facilitator for the SHLWS DQO meetings, raised the issue of formally documenting the decisions agreed to in DQO meetings. DOE-RL, PNL, and Ecology communicated to Ken the agreement made in the March 3, 1994, SHLWS UMM to include the SHLWS DQO meeting minutes as an attachment to the UMM minutes.

It was determined that this would be the last formal DQO meeting. Any of the issues noted above or future issues would be dealt with during the UMM (next meeting scheduled for April 14, 1994, 2-4:00 p.m., Mt. Rainier Conference Room, 337 Bldg.).

PNL will begin work on the sampling and analysis plan and the Closure Plan with the intent of obtaining a consensus on the sampling and analysis plan separate from the Closure Plan. This will permit sampling and analysis of the SHLWS T/S unit before formal approval of the Closure Plan has been obtained from Ecology. The Closure Plan will include the sampling and analysis plan as an appendix.

ATTACHMENT 1

Materials for the February 2, 1994, Meeting

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List of Attendees

SHLWS TIS Closure Plan
DQO Workshop

Name (Print)	Organization	Telephone
H Wayne Slater	PNL	376-0575
Clark Lindenmeier	PNL	376-8419
Bob O'Brien	PNL	375-6769
Brian Opitz	PNL	372-0069
Greta Davis	Ecology	736-3025
Alex Stone	Ecology	736-3018
Evan Dresel	PNL	376-8341
Steve Lijek	GSSC	946-3683
Joan Bartz	GSSC	946-3693
Randall Krekel	DOE	376-4264
Brian Day	PNL	376-3835
Kenneth Redus	GSSC/MACTEC	372-2318
Keith Martin	PNL/QA	376-9023
Janet Julya	PNL	376-7638

SULWS DQO 2/1/94

- STATE THE PROBLEM
- IDENTIFY THE DECISION
- ID THE INPUTS
- DEFINE THE BOUNDARIES

- SPECIFY LIMITS ON DECISION
- DEVELOP A DECISION RULE

- OPTIMIZE THE DESIGN

NEXT MEETING 2/9/94 2PM

"CLOSE SITE RELATIVE TO THE REMAINDER OF UNIT"

RCRA & CERCLA MUST BOTH BE MET

SITE IS DIRTY UNTIL PROVEN OTHERWISE.

9HW208.1252

INFO REQTS

MTCA
CLOSURE PLAN
WAC 173-303 REV.
SITE BACKGROUND
TPA REVISION

WAYNE / RANDY – HWD DIGS

ISSUES

(1) WHAT DOES CLOSURE MEAN IN TERMS OF CONTINUED USE OF WMA? WHAT IS POTENTIAL FUTURE USE? WHAT ARE IMPACTS?

(2) WHAT IS BOUNDARY OF CLEAN UP AREA?

(3) WHAT "HOW CLEAN" DO WE WANT? MTCA A, B, C?

(4) - WHAT ARE POTENTIAL FUTURE USES? TIES TO AREA A, B, C.

ALSO - LONG-TERM (DOES LONG-TERM USE HAVE AN EFFECT ON OUR DECISION?

(2)

(5) IS THE SITE PART OF EICHLAND? NOT NOW! IF TURNED OVER - IT WOULD BE LIGHT INDUSTRIAL ZONING.

(6) WHAT IS A INTERFACE BETWEEN OPERABLE UNIT (1100 - EAST) AND THE SWLWS T/S WELL?

RANDY K. + D IF EPA IS RPD

(3)

(1) WHAT WOULD BE THE BENEFIT OF HAVING A SEPERATE ERA ID NO. ON WHAT WE'RE TRYING TO ACCOMPLISH.

→ T/S ON NON-CONTIG PROPERTY

→ T/S HAS SAME ID AS ATTACH T/S ON PROPERTY.

→ DOE WILL BE ABLE TO TRACK WASTE MGT/ACTIVITIES ON PROPERTY.

→ UNKNOWN IMPACTS.

→ RESTRICTED TO USE FACILITY PERMIT.

(B) WHAT ARE SAMPLE ALTERNATIVES? IE

(a) PILOT STUDY, THEN DETAILED

(b) USE HISTORICAL ~~SOIL DATA~~ INFO ON DISCOLORATION AREAS FOR SPILLS TO BE TRUE AS PRELIM. SAMPLING AREAS

(C) HOW COMPLETE IS ALL THE DOCUMENTATION?

THE £90 ONE STORAGE INFO IS WAS BEEN UPDATED.

FUTURE ACTION → WAS AVAIL AT NEXT MTG.

(D) WHO WILL DO ANALYSIS?

PNL LAB — ANALYTICAL SERVICES PGM. USING DATACHEM & ET.

ANY CONTROL LIMITING

(11) THE SCHEDULE?! ~6/94 (5)

PHASE 2 (a) START SAMPLING IN SUMMER

(b) GET CLOSURE PLAN APPROVED

(c) DO SAMPLING BEFORE PUBLIC INVOLVEMENT.

(d) COMPLETE W/IN 6 MOS AFTER PUBLIC COMMENT CONCL

(12) WHAT ARE LAB CAPABILITIES FOR ANALYSIS (48 HR TO 35-45 DAYS)? WHAT VALIDATION WILL BE USED? HOW LONG WILL THIS TAKE?

(13) —

9413288.1257

(6)

OUR DECISION(S)

1. IS THE SITE DIRTY? { ✓ RESIDENTIAL - 19L ✓ INDUSTRIAL
   YES - HOW MUCH TO CLEAN UP TO?
   NO - "GO" DO WE NEED TO DO MORE SAMPLING?

2. AT WHAT LEVEL IS THE SITE CONSIDERED DIRTY?

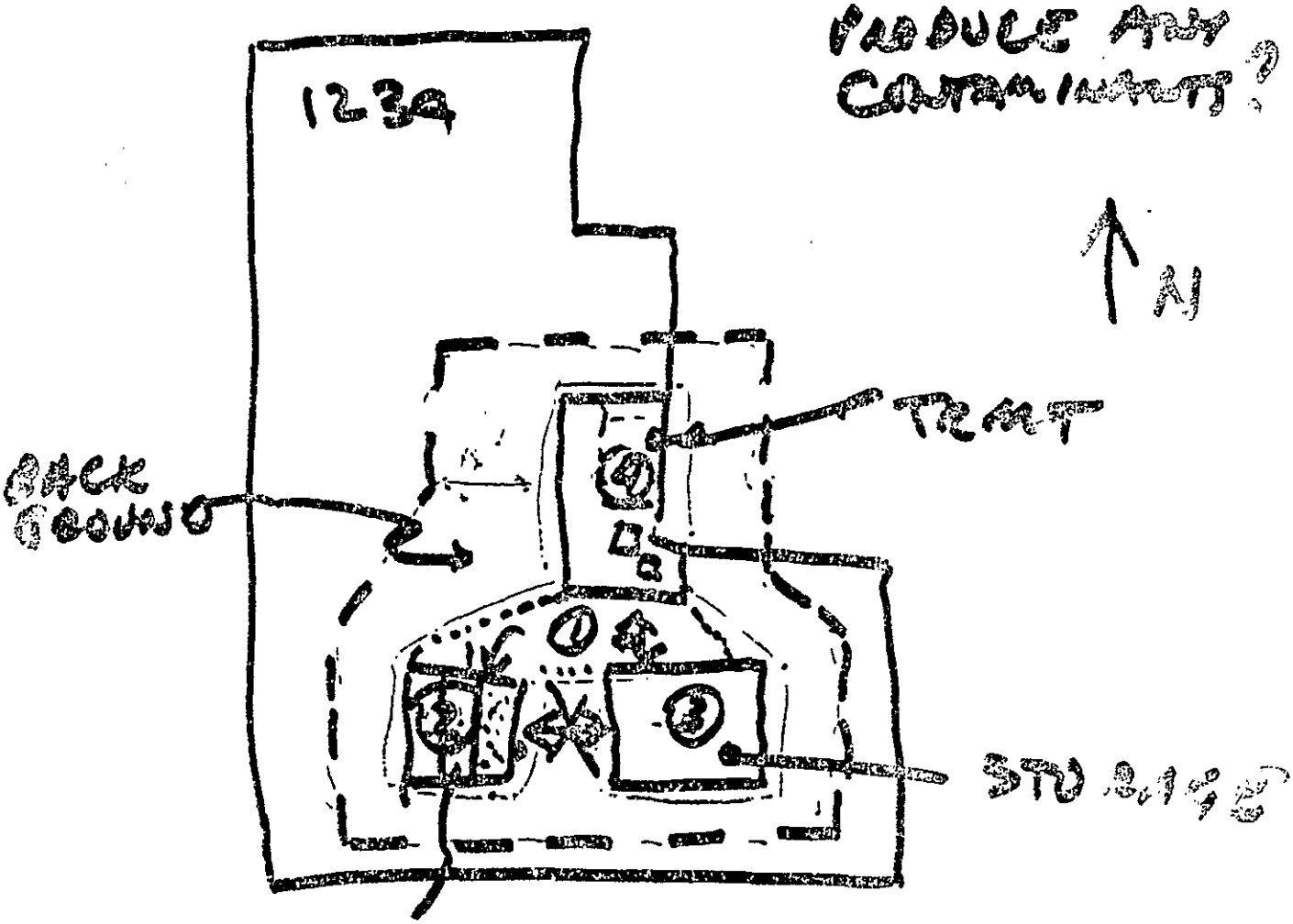
3. WHAT CONSTITUENTS MAKE THE DIRT DIRTY?

4. DOES SITE MEET RESIDENTIAL OR INDUSTRIAL STANDARDS WITHOUT CLEAN-UP?

7

WHAT IS THE PHYSICAL BOUNDARY?

DID THE ACTIVITIES PRODUCE ANY CONTAMINANTS?



ECOLOGY ECRA - BACKGROUND IS THE YARD } HEAVY METALS ONLY?

ECOLOGY CERCLA - TBD.

ACTIONS

(a) PGM PROVIDE UPDATED INFO (COC) TO ECOLOGY/EPA

(b) ECOLOGY (BCRA & CERCLA) WILL IO WHICH COC THEY ARE INTERESTED IN? AND VERIFY CONCUR

(c) ECOLOGY WILL BE COC FOR 90 DAY SURFACE AREA AND OTHER AREAS.

(d) PNL & ECOLOGY THINK ABOUT USING MAX, AVG, UPPER CONFIDENCE VALUE FOR DECISION LOWICS & LOC.

(e) PGM WILL DISTRIBUTE UPDATED DATA ON 90 DAY LOC.

ATTACHMENT 2

Materials for the February 7, 1994, Meeting

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Attendance at the 2nd SHLWS T/S
Closure Plan DQO

2/7/94

Greta Davis	Ecology	736-3025
Alex Stone	Ecology	736-3018
H. Wayne Slater	PNL	376-0575
Clark Lindenmeier	PNL	376-8419
Randall Krekel	US DOE	376-4264
Bob O'Brien	PNL	375-4969
Brian J. Day	PNL	376-3835
Keith Martin	PNL	376-9023
Evan Dresel	PNL	376-8301
Bill Cox	WHC	376-1978
Steve Lijek	GSSC	946-3683
Ken Redus	MATEC	372-2318

SHLWS DBO 2/7/94

OLD BUSINESS

(2) } 90 DAY LIST
(6) } CONSIDERED COMPLETE.

(1) VOA
(2) SEMI-VOA ✓ ORGANIC ANALYSIS IN 90-D
(3) TENT TA ✓ ORGANIC NOT NECESSARY ELSEWHERE
COMPDS

✓ ADDITIONAL:
TOTAL NITROGEN
(4) & NITRATE / NITRITE

Bubis - Please send out to
VERIFY the list of meeting participants
- BA Needs to add list of participants
- 90 in the material —
(JNS: Add Liz Bowers to mailing list. | Wayne See attached copy of note.
- "REMAINDER OF AREA" 12 — 9 = 3' × 3'

(5)
"THIS IS NOT A MAJOR PROBLEM

COMMENT - IF, AT SPILL SITE, WE SEE ORIGINAL SOIL, THEN USE ORIGINAL SOIL.

- IT IS UNKNOWN HOW MUCH SOIL WAS REPLACED IN SPECIFIC SPILL AREAS.
- SAMPLE AS DEEP AS POSSIBLE UP TO 3' USING HAND AUGER.
- AT THIS TIME, ECOLOGY CONSIDERS 21 A REASONABLE NO. OF SAMPLES, SOME WILL BE IN KNOWN SPILLS; OTHERS WILL NOT. USE ENGINEERING BIAS FOR SAMPLE LOCATION ED.

DECISION

1. ASSUME SITE IS DIRTY
   SHOW SITE IS CLEAN

2. SAMPLE AREAS
   - BACKGROUND
   - 90 DAY STORAGE
   - STORAGE
   - TREATMENT AREA

PARAMETER OF INTEREST
- MAX
- AVG

3. TIERED APPROACH.
   (a) IF SAMPLE INDICATES VALUE > BACKGROUND, THEN TAKE MORE SAMPLES TO CONFIRM IF IT IS AN OUTLIER
   (b) IF NOT, CONTINUE.

4. IF CONCENTRATION IN BACKGROUND > MTCA STDS, THEN THIS IS A [redacted] SITE ISSUE, AND PLAN WILL BE AMENDED.

5. IF ALL CONCENTRATIONS ≤ BACKGROUND, THEN CLEAN.

ALEX - "ENUF INFO" MODEL WILL BE ESTABLISHED

ACTION

~~AD HOC~~ ACTION - SITEWIDE VS LOCAL BACKGROUND

BOB. - LEAD
O'BRIAN

CLARK EVAN

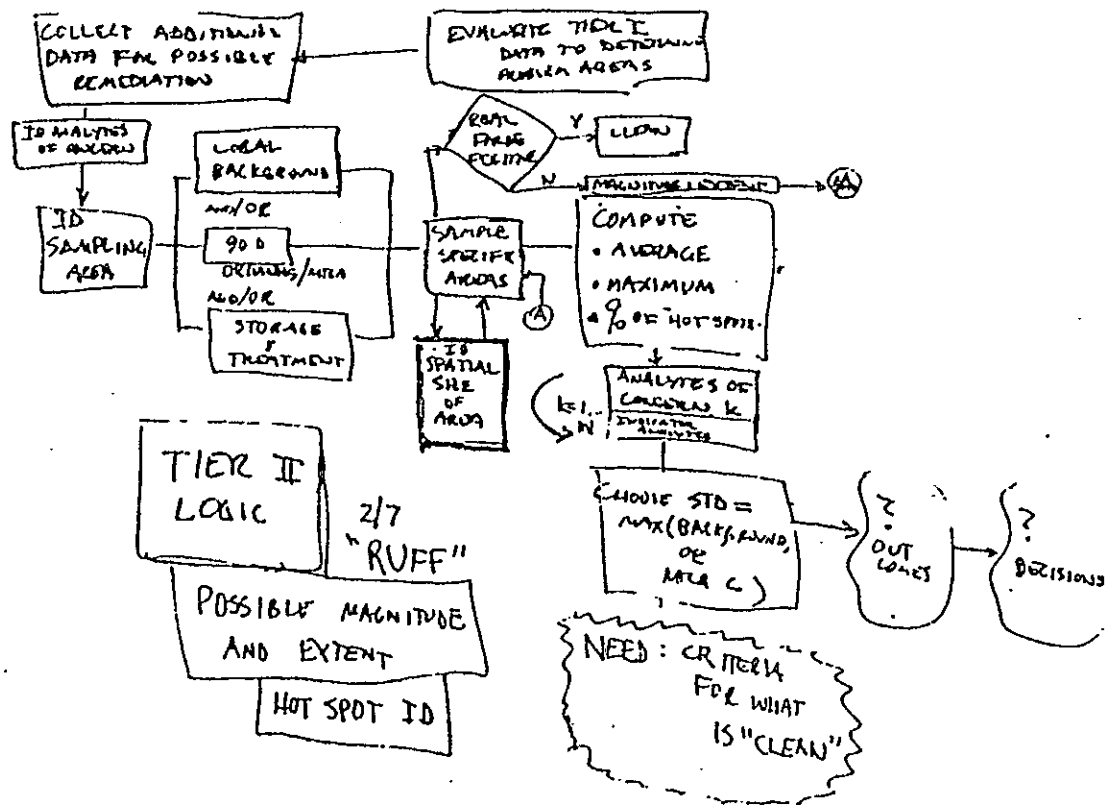
ACTION - ALEX WILL CHECK ON USE OF FIELD SCREENING.

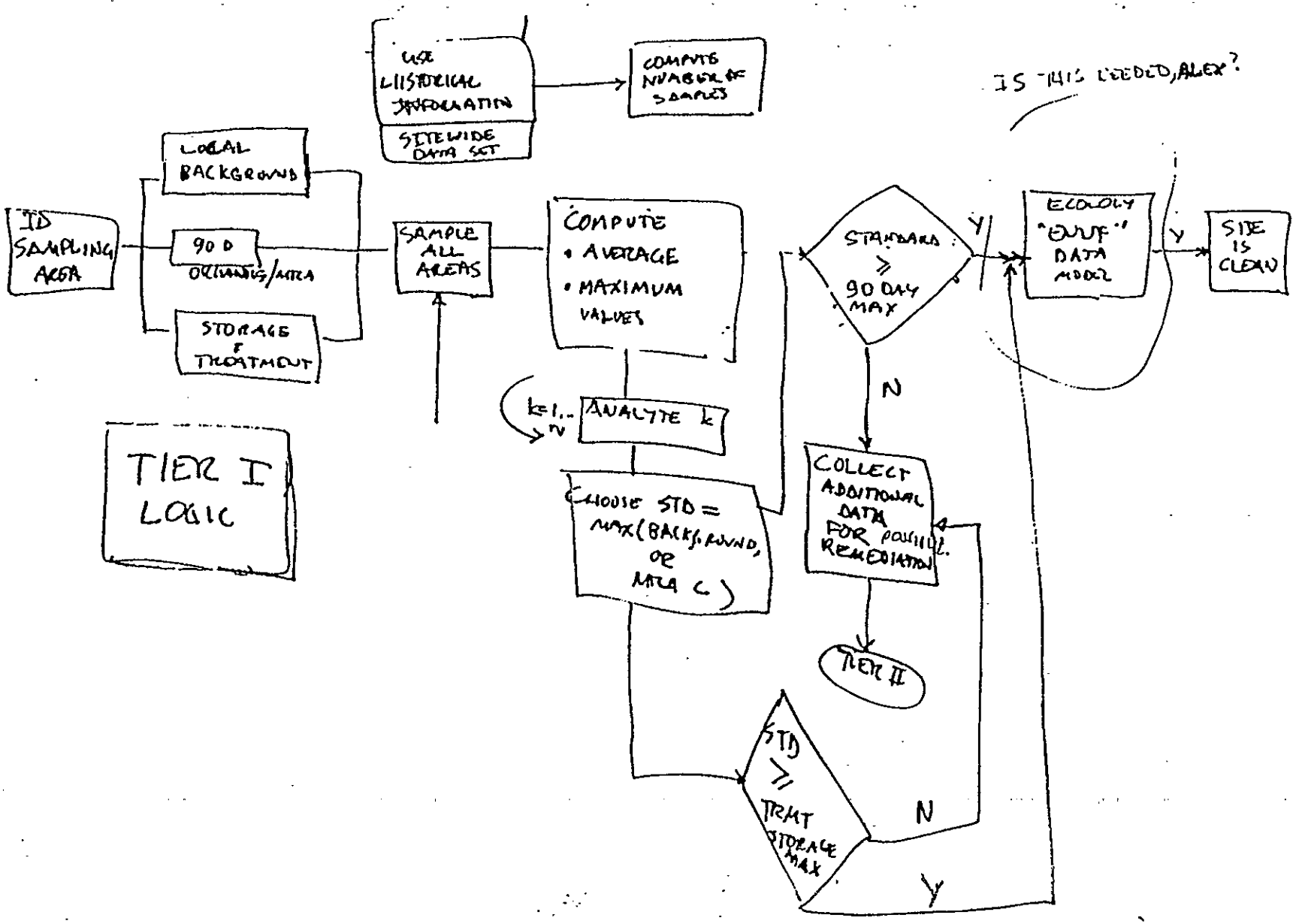
ACTION CLARK WILL EXAMINE FIELD SCREENING FOR HEAVY METALS.

ACTION COME UP W/ DECISIONS ON BACKGROUND (EVAN & CLARK)

ACTION MTCA C CUTPOINTS FOR AGREED ON ANALYTES

CLARK


COLLECT ADDITIONAL DATA FOR POSSIBLE REMEDIATION
EVALUATE TIER I DATA TO DETERMINE PROBLEM AREAS
ID ANALYTES OF CONCERN
LOCAL BACKGROUND
AND/OR
90 D
AND/OR
STORAGE & TREATMENT
ID SAMPLING AREA
REAL PROBLEM EXISTS
Y
N
SAMPLE SPECIFIC AREAS
ID SPATIAL SIZE OF AREAS
COMPUTE
• AVERAGE
• MAXIMUM
• % OF HOT SPOTS
ANALYTES OF CONCERN k
k=1..N
CHOOSE STD = MAX(BACKGROUND, OR MCL C)
? OUT LIMITS
? DECISIONS
TIER II LOGIC
2/7
"RUFF"
POSSIBLE MAGNITUDE AND EXTENT
HOT SPOT ID
NEED: CRITERIA FOR WHAT IS "CLEAN"


USE HISTORICAL INFORMATION
SITEWIDE DATA SET
COMPUTE NUMBER OF SAMPLES
IS THIS NEEDED, ALEX?
LOCAL BACKGROUND
ID SAMPLING AREA
90 D
STORAGE & TREATMENT
SAMPLE ALL AREAS
COMPUTE
• AVERAGE
• MAXIMUM VALUES
STANDARD ≥ 90 DAY MAX
Y
ECOLOGY "BUILT" DATA MODEL
Y
SITE IS CLEAN
k=1..n
ANALYTE k
N
TIER I LOGIC
CHOOSE STD = MAX(BACKGROUND, OR MCA C)
COLLECT ADDITIONAL DATA FOR POSSIBL. REMEDIATION
TIER II
STD ≥ TRMT STORAGE MAX
N
Y

ATTACHMENT 3

Materials for the February 24, 1994, Meeting

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SHLWS/TS DQO MEETING

February 24, 1994

Name	Organization	Phone
Kenneth Redus	MACTEC	372-2318
Bob O'Brien	PNL	375-6769
Randall N. Krekel	US DOE	376-4264
Brian J. Day	PNL	376-3835
Alex Stone	Ecology	736-3018
Greta Davis	Ecology	736-3025
H. Wayne Slater	PNL	376-0575
Clark Lindenmeier	PNL	376-8419

SULWS ODD

2/14/94

(14)

1. OLD BUSINESS

- ACTION (MAK, ETC) TO BE DISCUSSED LATER TODAY

2. FIELD SCREENING (METALS)

- NO OBJECTION TO USING OVEC COMPUTER W/ EQ AREA TO BE CLEANED UP. USED AS "CONFIRMATORY" TOOL NOT PRIMARY TOOL. > 2 SAMPLES REQ. IF USED.

- FIELD SCREENING (ORGANICS) NOT VIABLE.

- CLARK - BIRD SCREENING METHODS ARE GOOD AND BEING WORKED

- ALEX - ECOLOGY MODEL - NOT APPLICABLE

NEW BUSINESS

1. COC / ANALYSES LIST.

METHOD: GOOD ECD - METHOD CANNOT DO:

- ARSENIC
- BORON
- CERIUM
- DYSPROSIUM
- EUROPIUM
- GADOLINIUM
- STRONTIUM
- THORIUM

SEE ATTACHED

↳ SEE NEXT PAGE

- LANTHANUM
- LEAD
- MERCURY
- MOLYBDENUM
- NEODYMIUM
- SELENIUM
- SILICON

Table 3.2 Analyzed Composition of SHLWS

Constituent	Concentration (mg/L) PW-0	PW-7A
Aluminum	3300	6300
Antimony	(240)[a]	(200)
Arsenic	<0.2[b]	<10
Barium	4700	210
Boron	(70)	(70)
Cadmium	900	<10
Calcium	2200	2800
Cerium	40000	67000
Chromium	2600	190
Cobalt	2390	90
Copper	150	160
Dysprosium	9500	12200
Europium	200	190
Gadolinium	4000	3300
Iron	24000	13900
Lanthanum	27000	26000
Lead	(560)	(600)
Magnesium	340	870
Manganese	80	67
Mercury	0.4	0.
Molybdenum	44000	80
Neodymium	21400	26800
Nickel	8500	100
Potassium	14000	5700
Selenium	<0.022	<10
Silicon	780	450
Silver	530	<10
Sodium	900	59500
Strontium	9000	50
Tellurium	(500)	(600)
Titanium	120	80
Yttrium	4400	5600
Zirconium	35800	2000

(a) Values in parentheses are reported detection limits.

(b) "Less than" values are detection limits.

PAGE 16 INDICATES ALL ANALYSES REQ.

X - NOT REQ

+ - GEOLOGY INVESTIGATE

⊗ - REQ

blank - REQ

5/13/88.1275

RAD REQMTS

Gross α
Gross β
} TOTAL ANALYSIS SCREEN.

CRITERIA > 2000 pCi/g

MTCA — 50000 pCi/g

> ⇒ RADIOACTIVE FOR SHIPPING UNDER DOT

< ⇒ NOT RADIOACTIVE/NOT REG

RAD IS A JURISDICTION ISSUE.

(18)

ACTION

(1) RANDY — TALK TO STATE ON CRITERIA FOR RAD & HOW USED IN AIR PERMIT.

THIS WILL SERVE TO RESOLVE:

IF BACKGROUND > MTCA THEN DO NOT CONSIDER GROUNDWATER BACKGROUNDS

(2) J. ENTRIKIN (ECOLOGY)

10 MRAD ABOVE BACKGROUND

≥ 4 RADS REMEDIATED

< 4 DOES NOT REQUIRE REMEDIATION

RAD CONSENSUS

1. JURISDICTIONAL ISSUE
2. FOLLOW DOT CRITERIA
3. COLLECT CROSS & CROSS (3/10)
4. INTERNET IMPACT OUTSIDE THIS DOD
5. [redacted] PERFORM RAD SCREENING ON FRAG SAMPLES FOR METALS.

CONCLUSION

BETWEEN RAD CONSENSUS MEETING RAMOS'S PLAN WHAT'S DIFFERENCE

20

ORGANICS

8240 } ECOLOGY'S
8270 } RECOMMENDATION

- DO NOT DO METHOD 25 USED.

- ECOLOGY SUGGESTION -
  - USE 8240/8270 TO EXAMINE UNIDENTIFIED ORGANICS. USE THE ANALYSIS OF 3 GERMANE SAMPLES.
  - DO THIS IS 90 DAY SAMPLES.

- PNL SUBSTITUTE 8260 FOR 8240.

ECOLOGY WILL CHECK IF OK, NEW LIST 8260.

911208.1278

(21)

- PNL PROPOSED TO EXAMINE
  - ETHYLENE GLYCOL
  - ISOPROPYL ALCOHOL] PROBABLY WILL FALL INTO TEC.

IF HITS, THEN

~~(1) TALK TO CORPS ABOUT CLEAN UP~~
~~WE~~
~~(2) CLEAN UP [illegible]~~
~~(PNL)~~

[illegible]

(1) TAKE BACKGROUND AND

(2) DETERMINE RETAIN[illegible] BY CONTRACTING CORPS, ETC

9413288.1229

22

NITRATES / NITRITES

METHOD ANION
STD SW846.
TBD CLARK
ALAN

2. CLEAN UP STDS

QUESTION:

MTCA C (INDUSTRIAL)
VS
LOCAL BACKGROUND

a. ACTION – WHAT IS STATISTICAL PARAMETER TO BE USED (AVG, MAX)

b. ACTION – WHAT DOES ECOLOGY WANT NUMBER TO BE: ABSOLUTE MAX, ?.

9413288.1280

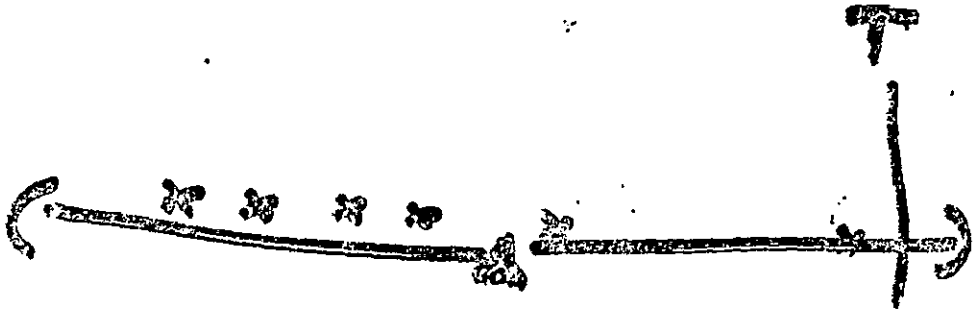
(3)

- IN S/T AREA or 90 Day

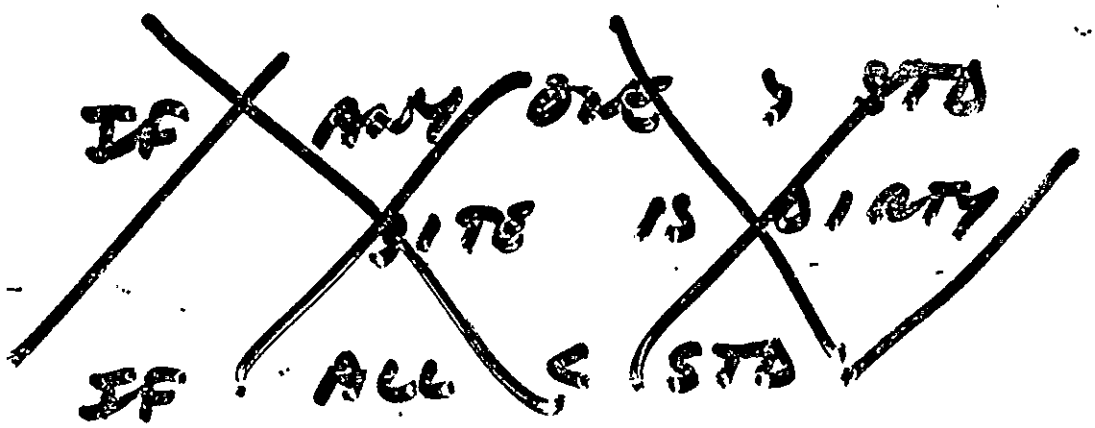
1. PERFORM SAMPLING
2. COMPARE TO AREA B.G. LEVELS
3. ASSUME A SITE DIRTY UNTIL PROVE IT IS CLEAN.
4. COLLECT DATA
5. COMPARE STAT NUMBERS TO STD.

IF ANY ONE > STD.
SITE IS DIRTY

IF ALL ≤ STD
SITE IS CLEAN



GIVEN:
DATA



IF DATA INDICATES POTENTIAL HOT SPOT, THEN USE MTCA.

"IF DATA EXCEEDS MTCA 3 THEN

(1) REMEDIATION CONCERNS NEED TO BE ADDRESSED

(2) LOCAL BACKGROUND MAY BE CONSIDERED

CLOSED FOR [illegible]

(25)

BACKGROUND SAMPLES

1. COLLECT DATA
2. FIT TO PROBABILITY DISTRIBUTION

SAMPLE UNIT SAMPLES

1. COMPARE EACH STN TO 2 ABOVE
2. USE TOLERANCE INTERVAL.

<u>ACTION</u>: BOB EXAMINE ECOLOGY DOC TO CONFIRM THIS IS 95% CONFID FOR 95% TOLERANCE.

(26)

RE: FIELD SCREENING FOR ORGANICS - MAY BE ABLE TO USE EXISTING MOBILE UNIT [EVAL]

REVIEW / PHONE CONV.

- DATA REVIEW
- DATA VALIDATION

CLOSE EVAL LOG

ATTACHMENT 4

Materials for the March 14, 1994, Meeting

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Attachment A

XXXXXXXX
XXXXX

ERS 94-113

STATE OF WASHINGTON

DEPARTMENT OF HEALTH

Airdustrial Center Bldg 5 • Mail Stop XXXX • Olympia Washington 98504

January 7, 1993

David L. Stanton
Safety Office
US Army Corps of Engineers
Walla Walla, Washington 98362-9265

9413280.1286

Dear Mr. Stanton:

In previous months the subject of allowable exposure to the public has surfaced. This discussion, for our context, was related to the release of the Arid Lands Ecological Reserve. Following discussions with the Department of Energy and its contractors, the Department of Health has determined that a 10 mrem effective dose equivalent above background is an acceptable limit..

As with any interim dose limit that is established as acceptable there are exceptions. The EPA, in conjunction with the NRC and agreement states, has recently initiated an environmental radiation standards development process. These standards, when set, may be in the form of risk/dose limits or radionuclide specific values. I expect this process to take one to two years. The state of Washington is also independently working on soil/sediment environmental radiation standards. We anticipate this work to be completed by the end of 1994. Any of these processes may change our agreed upon interim standard.

If you have any questions or desire further clarification please call me at (206) 586-3306.

Sincerely,

John L. Erickson

John L. Erickson, Head
Environmental Radiation Section
Division of Radiation Protection

JLE:DT:KP

cc: Dibakar Goswami, Ecology

In MTCA, RCW 70.105D.020 (4) Definitions states that "'Federal cleanup law" means the federal comprehensive environmental response, compensation, and liability act of 1980, 42 U.S.C. Sec. 9601 et seq., as amended by Public Law 99-499.' MTCA continues under RCW 70.105D.020 (5) (c) to state that (5) "'Hazardous substance means:' (c) 'Any substance that, on March 1, 1989, is a hazardous sustance under section 101(14) of the federal cleanup law, 42 U.S.C. Sec. 9601(14).'

WAC 173-303-610 (2) of the State of Washington Dangerous Waste Regulations, states (2) where the closure requirements of this section , or of.....call for the removal or decontamination of dangerous wastes, waste residues, or equipment, bases liners, soils or other materials containing or contaminated with dangerous wastes or waste residue, then such removal or decontamianton must assure that the levels of dangerous waste or dangerous waste constituents or residues do not exceed: (i) 'For soils ground water, surface water, and air, the numeric cleanup levels calculated using residential exposure assumptions according to the Model Toxics Control Act Regulations...'

The Tri-Party Agreement (volume 1, September 1992) states in section 6.3 Treatment, Storage, and Disposal Closure Process (page 6-4) 'The TSD units containing mixed waste will normall be closed with consideration of all hazardous substances, which includes radioactive constituents.'

QC REQUIREMENTS FOR A RCRA PROJECT

Duplicates:	1 in 20	Will need 1
Matrix Spikes	1 in 10	Will need 2 Extra volume added to 2 samples Organics only
Daily Trip Blanks:	Daily	VOA water sample Prepped in PNL lab Not opened in the field
Transfer Blanks:	1 in 10	VOA water sample Prepped in PNL lab Boiled deionized water transfered to VOA bottles in the field.
Equipment Blanks:	Daily	Either daily or at the end of the sampling. All constituents tested for that are being tested for
Full Trip Blank	1 in 20	Will need 2 but we do not have certified dirt to

DQO Meeting #4
March 10, 1994

Name	Organization	Phone
Wayne Slater	PNL	376-0575
GT Thornton	PNL	376-8662
Joan K. Bartz	GSSC	372-2008
Jennifer Sheriff	GSSC	946-3682
Janet Julya	PNL	376-7638
Clark Lindenmeier	PNL	376-8419
Randall Krekel	US DOE	376-4264
Alex Stone	ECOLOGY	736-3018
Greta Davis	ECOLOGY	736-3025
Brian Day	PNL	376-3835
Keith Martin	PNL	376-9023
Kenneth Redus	MACTEC	372-2318